DK

eyewonder

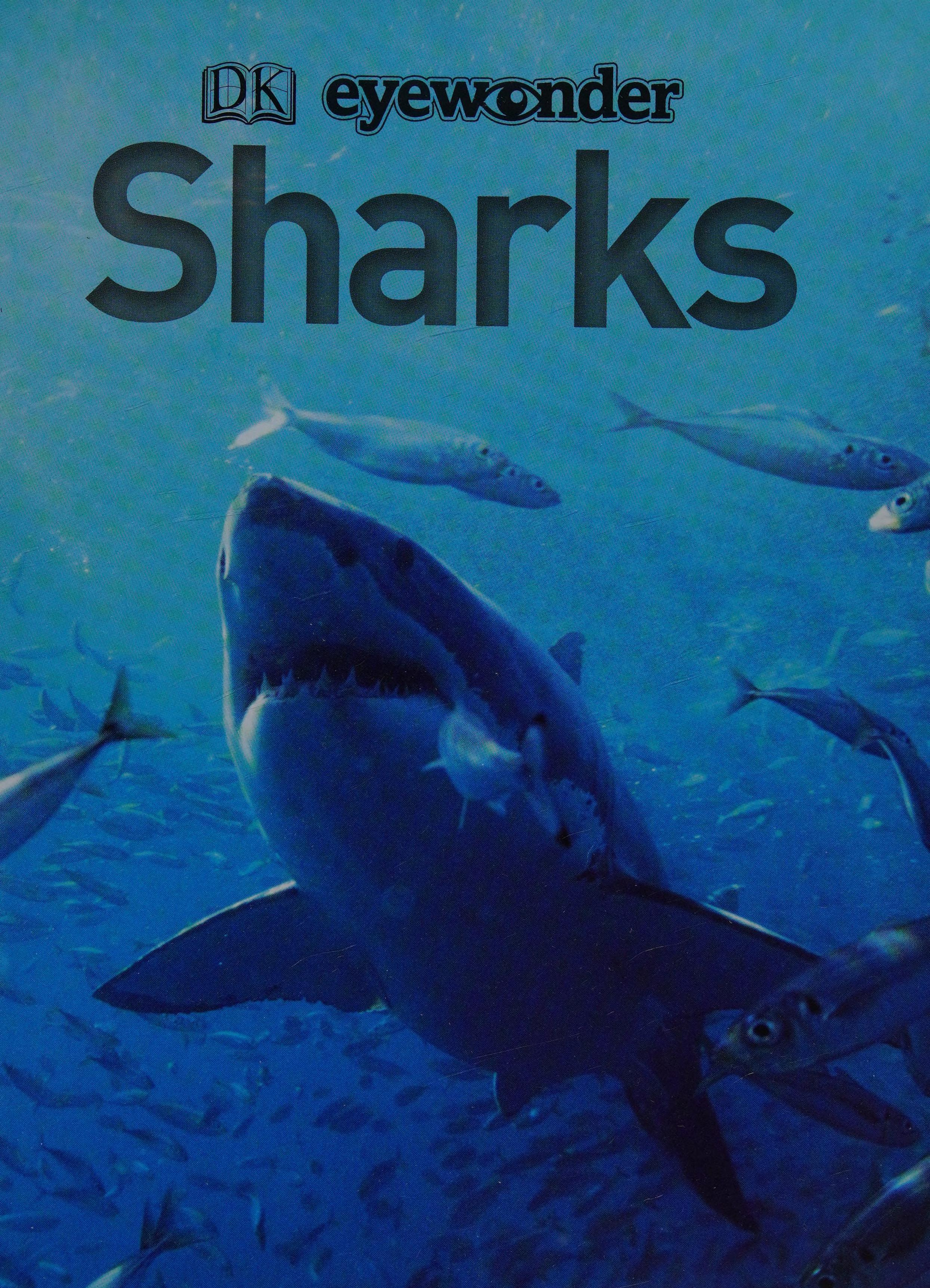
Sharks

now includes **fun** activities and stickers!

Open your **eyes** to a **world** of **discovery**

DK eyewonder

Sharks



LONDON, NEW YORK,
MELBOURNE, MUNICH, and DELHI

Written and edited by Fleur Star
Designed by Gemma Fletcher
and Sophie Pelham
Art director Rachael Foster
Publishing manager Bridget Giles
Picture researcher Liz Moore
Production editor Sean Daly
Production controller Pip Tinsley
Jacket designer Natalie Godwin
Jacket editor Mariza O'Keeffe
Consultant Dr Trevor Day

REVISED EDITION
DK UK
Senior editor Caroline Stamps
Senior art editor Rachael Grady
Jacket editor Manisha Majithia
Jacket design Nishesh Batnagar and Mark Cavanagh
Jacket design development manager
Sophia M Tampakopoulos Turner
Producer (print production) Mary Slater
Producer (pre-production) Francesca Wardell
Publisher Andrew Macintyre

DK INDIA
Senior editor Shatarupa Chaudhuri
Assistant editor Priyanka Kharbanda
Art editor Amit Varma
Managing editor Alka Thakur Hazarika
Managing art editor Romi Chakraborty
DTP designer Dheeraj Singh
Picture researcher Sumedha Chopra

First published in Great Britain in 2009
This edition published in Great Britain in 2015
by Dorling Kindersley Limited
80 Strand, London WC2R 0RL

Copyright © 2009, © 2015 Dorling Kindersley Limited
A Penguin Company

13 14 15 16 17 10 9 8 7 6 5 4 3 2 1
001 – 253531 – 02/15

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner.

A CIP catalogue record for this book
is available from the British Library.

ISBN 978-1-4093-4506-0

Colour reproduction by Scanhouse, Malaysia
Printed and bound in China by Hung Hing

Discover more at
www.dk.com

Contents

4-5
Introducing sharks

6-7
The inside story

8-9
Heads...

10-11
... And tails

12-13
Super swimmers

14-15
Lots of sense

16-17
Jaws

18-19
Feeding frenzy

20-21
Bottom feeders

22-23
Migration

24-25
Young sharks

26-27
Attack!

28-29
Big beasts

30-31
Hammerheads

32-33
Relative rays

34-35
Hangers on

36-37
Hunting sharks

38-39
Endangered species

40-41
Diving with sharks

42-43
Sharks from the past

44-45
Weird and wonderful

46-47
True or false?

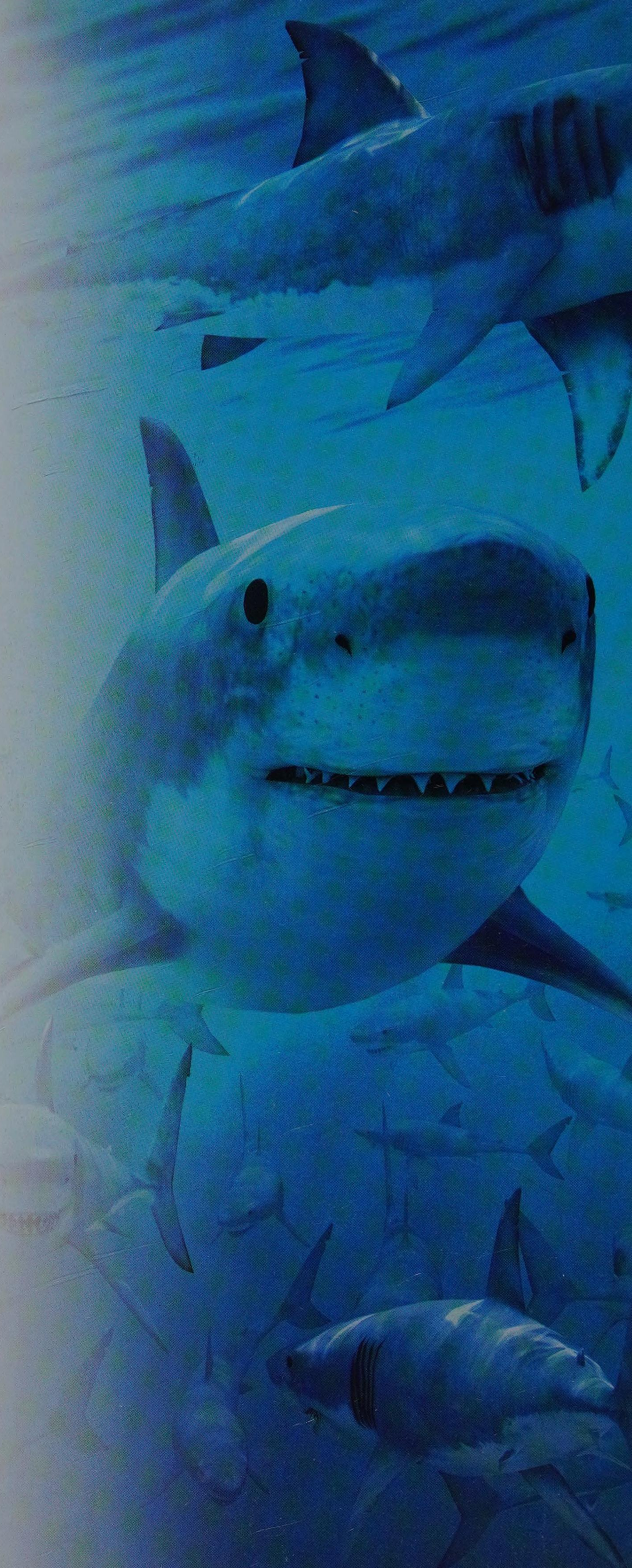
48-49
Which way?

50-51
Great escape!

52-53
Facts match

54-55
Glossary

56
Index and
acknowledgements



Introducing sharks

Sharks include the biggest fish in the sea – but not every species is huge, and most are not dangerous to people either. There are more than 500 species of shark, from the gigantic whale shark to the tiny dwarf lanternshark.

10 m (33 ft)

Basking shark

18 m (60 ft)

Whale shark

Gentle giants

Found in warm tropical waters, whale sharks cruise at about 3 kph (1.8 mph). They can grow up to 18 m (60 ft) long – so big, they sometimes bump into ships!

The pattern of spots is

Shark facts

- Sharks live in every ocean in the world. A few species are found in rivers too.
- Apart from humans, a shark's biggest enemy is another shark – many will eat their own species.
- Only about four people a year are killed by sharks.

Big sharks, little sharks

6 m (20 ft)
Great white shark

3 m (10 ft)
Nurse shark

Dwarf lanternshark
21 cm (8 in)

Great hammerhead shark
6 m (20 ft)

Spinner shark
2.8 m (9 ft)

Tiger shark
5.5 m (18 ft)

Brownbanded bamboo shark
1 m (3¼ ft)

different on each whale shark.

Whale sharks
are harmless
to people.

The inside story

Sharks are not the same as bony fish such as cod and trout. Sharks are cartilaginous fish – they have skeletons made of cartilage.

Sharp skin

A shark's skin is rough, covered in sharp scales called denticles. It's a bit like having skin covered in teeth. As a shark grows, the denticles fall out and are replaced by bigger ones.

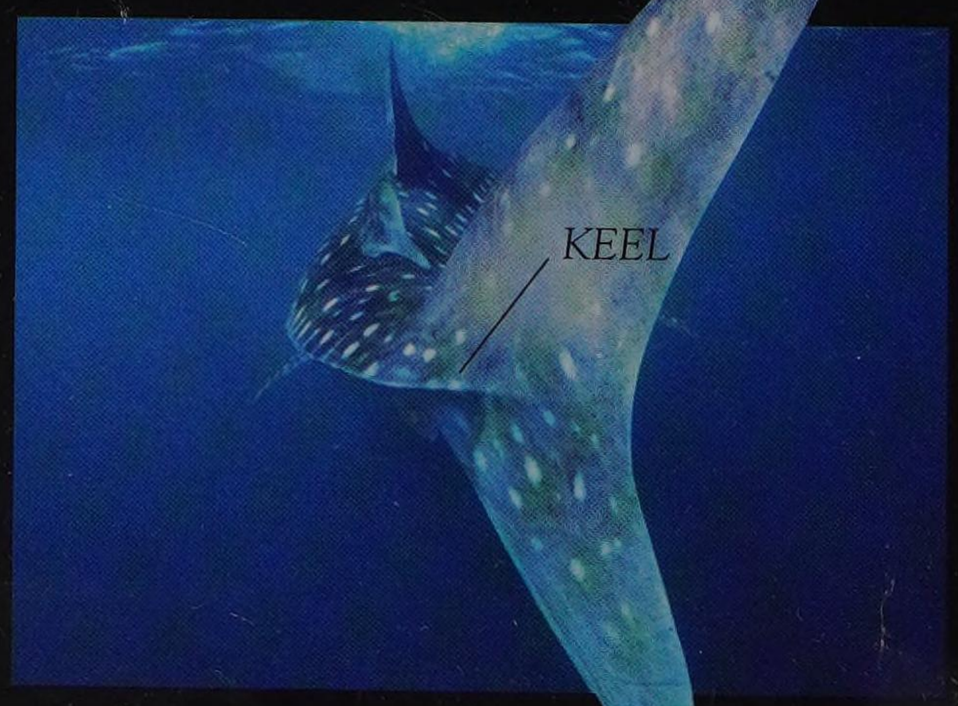
CAUDAL FIN
The caudal fin is the shark's tail. It is made up of two parts called lobes.

SECOND DORSAL FIN

STOMACH
Many sharks can turn their U-shaped stomach inside out to throw up an unwanted meal.

ANAL FIN
Not all sharks have an anal fin.

PELVIC FIN
Pelvic and pectoral fins come in pairs. All other fins are unpaired.



Tail details

Some fast-swimming sharks have a keel on either side of their caudal fin, or tail. It is thought that this helps the tail move smoothly from side to side when the shark swims.

Getting oxygen

Living underwater, sharks cannot breathe in air like people do. Instead, they take in water through the mouth. This passes over the shark's gills, which absorb oxygen from the water. The water then escapes through gill slits in the skin.

Most sharks have five gill slits.

DORSAL FIN
Sharks use their fins in different ways. The dorsal, pelvic, and anal fins stop the shark from rolling over.

VERTEBRAL COLUMN
Joined-up blocks of cartilage act as the shark's spine.

GILLS
Some sharks have an extra pair of gill openings called spiracles. These supply oxygen to the eyes and brain.

SNOUT

NOSTRIL
Sharks don't use their nostrils to breathe, just for smelling.

LIVER
The shark's liver is full of oil, which helps the shark's ability to float in the water.

PECTORAL FIN
This pair of fins steers and gives lift.

Cartilage is lighter and more flexible than bone.

Sink or swim!

Bony fish have a swim bladder – an air sac that helps a fish to float or sink in the water. Sharks don't have swim bladders, and must keep swimming so they don't sink. Basking sharks have such large, oil-filled livers, they can swim slowly without sinking.

Heads...

Blunt snouts, pointed snouts, even one covered in teeth... Not every shark looks the same. In fact, nearly every species has its own head shape.

Sharp and sleek

Having a pointed snout gives the blue shark a streamlined shape for swimming.

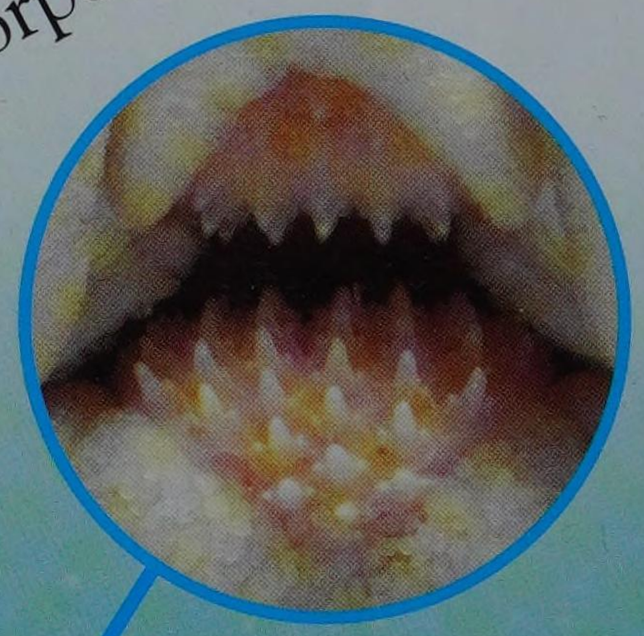
A streamlined snout cuts through the water like a torpedo.

Eyes front!

Some sharks, such as the bull shark, have their mouths set back behind their eyes. Others, such as the mako shark, have their mouths in front of their eyes. This difference is one of the features that scientists use to identify sharks.

Bull shark

Mako shark



They may be tiny, but the Port Jackson's teeth are sharp enough to hold onto prey.

Pig head

With its blunt head and snout, it's easy to see why the Port Jackson shark is sometimes also called the "pig fish". The shark's huge nostrils help it sniff out prey such as shellfish and sea urchins.

Feeling for food

Nurse sharks have feelers, called barbels, at the end of their snout. They use them to poke about on the seabed, feeling for food.

Saw shark

Barbel

Saw point

The very unusual-looking saw shark has a long, pointed snout with teeth that stick out on either side. Halfway down the snout are two long, flexible barbels.

Eye protection

Some sharks, such as the hammerhead, have special third eyelids. This membrane can cover and protect the eye while the shark thrashes about with prey in the water.

Wide as a whale shark

The mouth of a whale shark is at the very end of its flat, wide snout. At 1.5 m (5 ft) wide, the shark's mouth is huge – but its eyes are tiny.

... And tails

Whether big or small, uneven or equal-sized, plain or patterned, all sharks' tails are powerful. Swinging from side to side, the tail creates lift as a shark swims along. It's a shark's driving force!

Black tip shark

Great white shark

The tail's two lobes are almost identical.

Upper lobe

Lower lobe

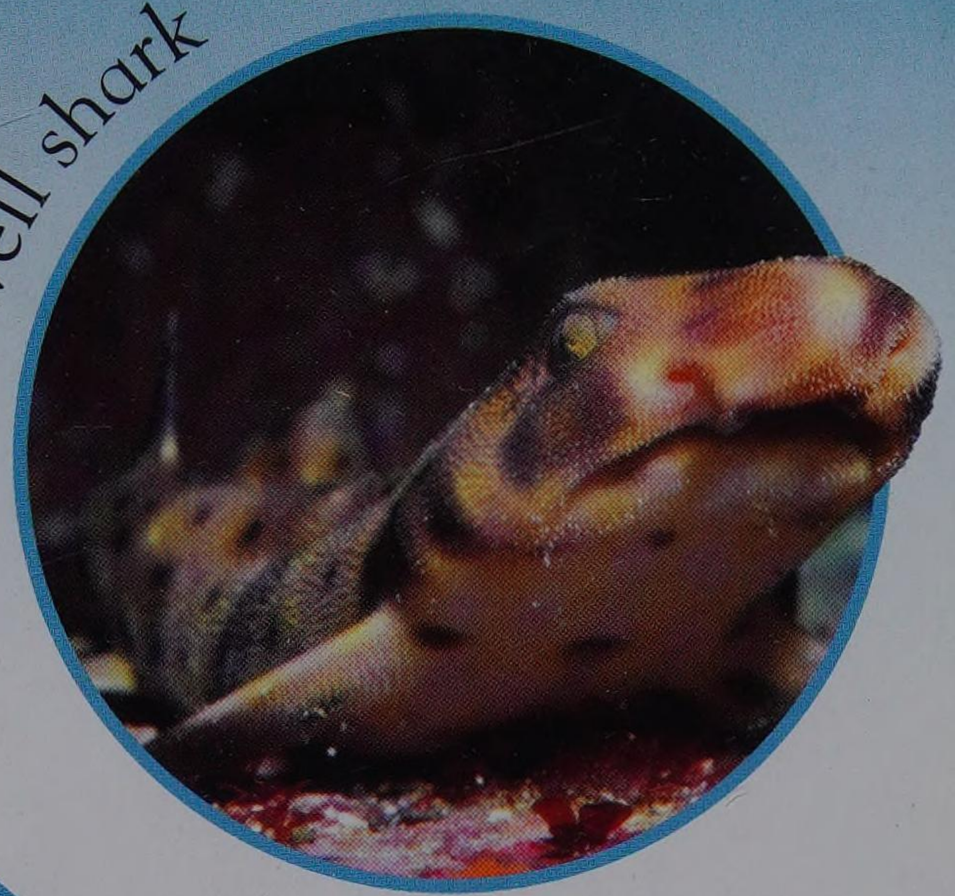
A typical tail

Tails are made up of upper and lower lobes. The lobes on most fish are of equal size, but in sharks the top lobe is often bigger than the bottom.

Turbo tail

In fast sharks, such as the great white, the two lobes of the tail are almost the same size. This gives the tail extra height so it creates more power.

Thresher shark



Swell shark

Mako shark

Making a point

The upper lobe on a thresher shark's tail is as long as its body – up to 2.5 m (8 ft) long. It uses the fearsome blade to stun prey.

Leap for life

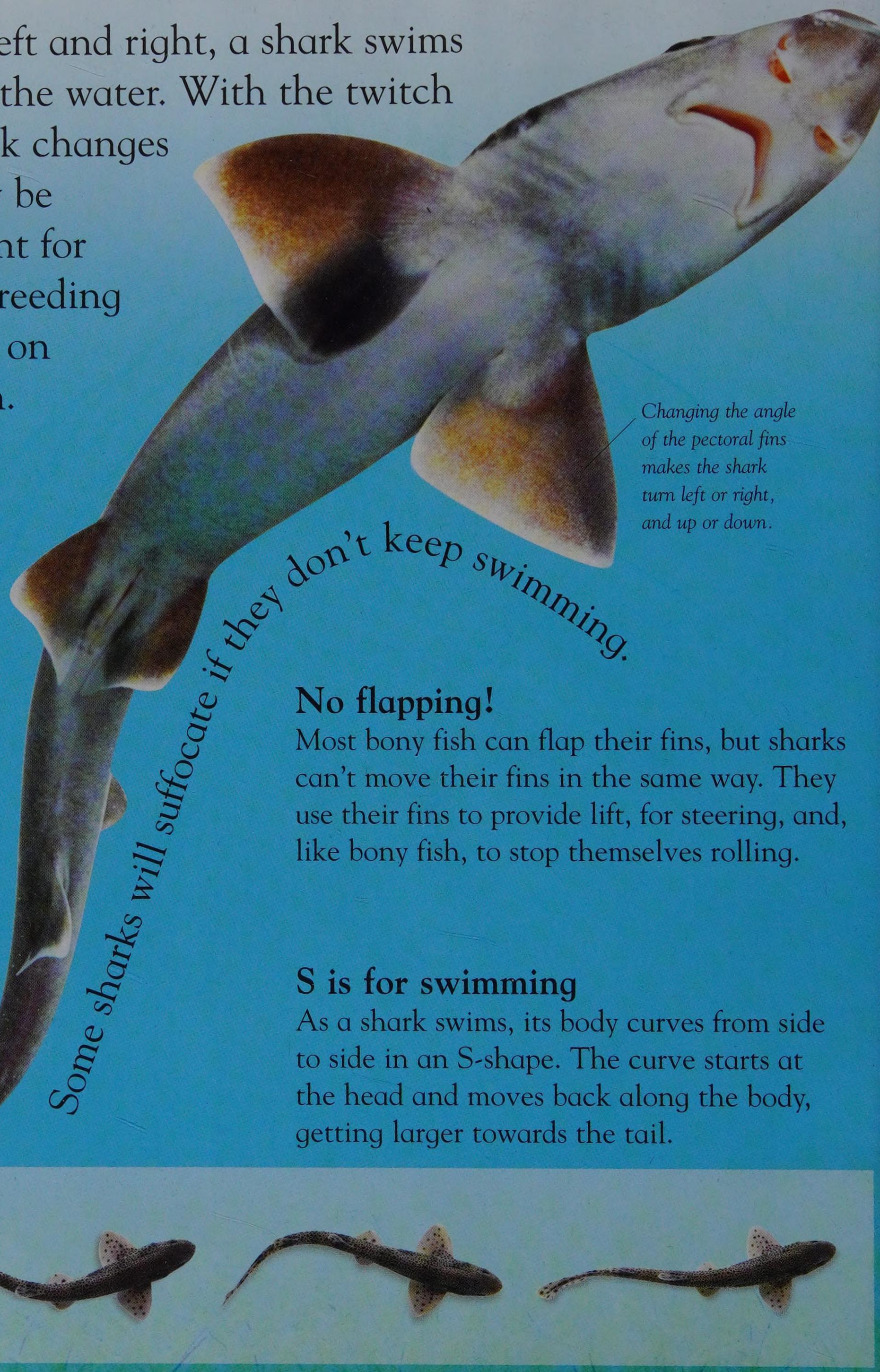
A mako shark's tail creates so much power and speed, the shark can leap up to 6 m (20 ft) out of the water.

Slow but safe

Bottom-feeding swell sharks are slow swimmers so they don't need big tails for extra speed. Their spotty pattern acts as camouflage against the seabed.

Super swimmers

Moving its tail left and right, a shark swims silently through the water. With the twitch of a fin, the shark changes direction. It may be swimming to hunt for food, to seek a breeding partner, or to go on a long migration.



Changing the angle of the pectoral fins makes the shark turn left or right, and up or down.

Fantastic fins

Sharks need their fins in order to swim. The caudal fin, or tail, is very important. It is the shark's "engine" – it provides thrust (pushing power) and lift (to stop the shark sinking).

Caudal fin

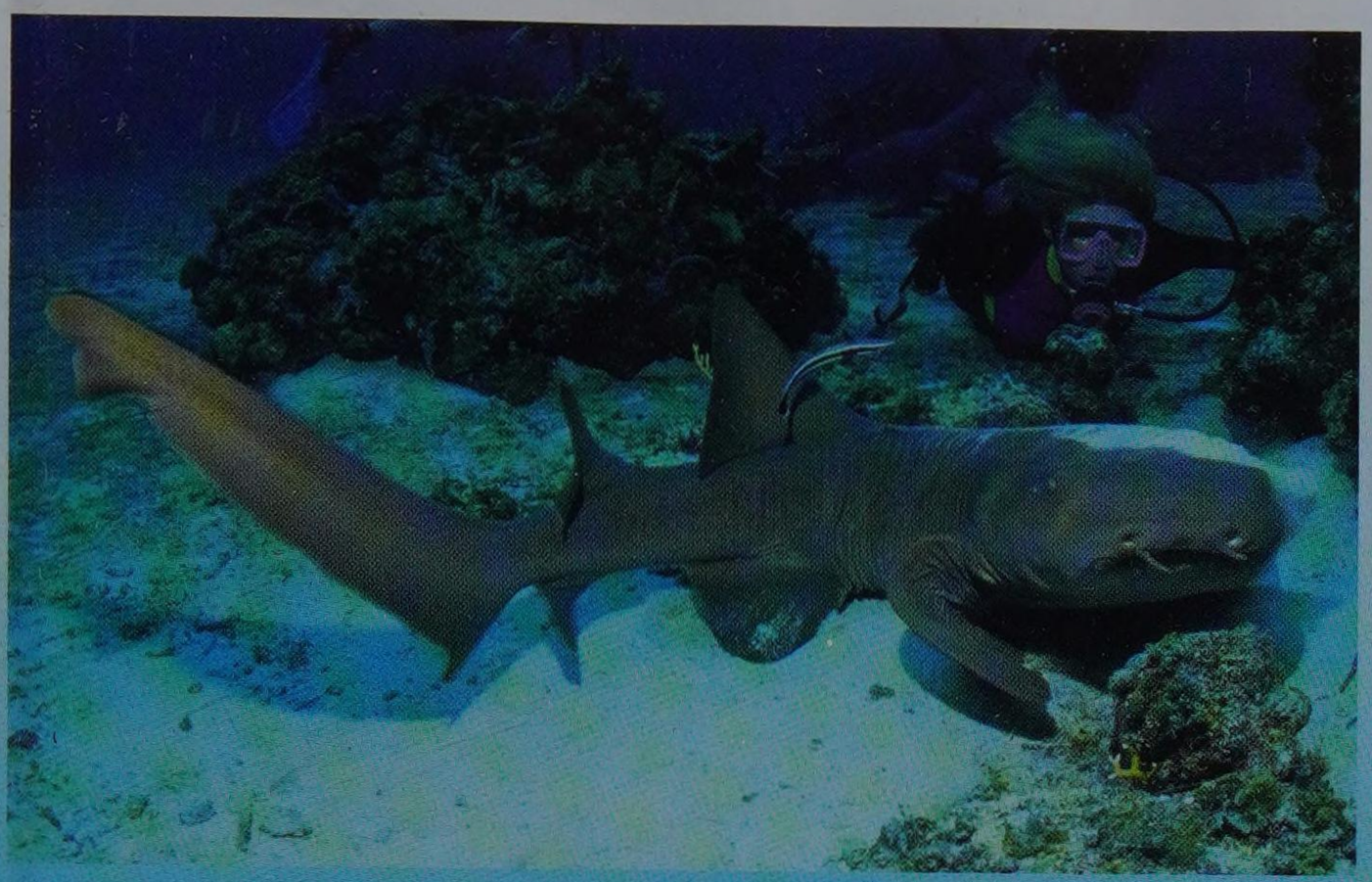
Some sharks will suffocate if they don't keep swimming.

No flapping!

Most bony fish can flap their fins, but sharks can't move their fins in the same way. They use their fins to provide lift, for steering, and, like bony fish, to stop themselves rolling.

S is for swimming

As a shark swims, its body curves from side to side in an S-shape. The curve starts at the head and moves back along the body, getting larger towards the tail.



Breathing in water

As sharks swim, the flow of water in through the mouth and over the gills provides oxygen for the shark to survive. Nurse sharks spend lots of time resting on the seabed, so to get oxygen, they use their cheek muscles to suck in water.

Who's the fastest?

If all sharks had a race, mako sharks would win: they can swim at 97 kph (60 mph). Blue sharks would probably come second: over short distances, they can reach speeds of 69 kph (43 mph).

Blue shark

If the two sharks chased the same prey, the mako would shoot forwards and overtake the blue shark.

Mako shark

Swimming facts

- Sharks can't stop suddenly. They must move left or right to avoid collisions.
- Sharks can't swim backwards.
- Small sharks bend more than large sharks when swimming.

Walking in water

Epaulette sharks don't just use their pectoral fins for swimming, but for walking too! They pull themselves along the seabed with the fins while they search for food.

Lots of sense

Sharks have all the five senses that people do (seeing, hearing, smelling, tasting, and touching), plus an extra "electrical sense" that helps them find prey.

Cats also have a tapetum. It reflects light, which can make their eyes look shiny.

Special sight

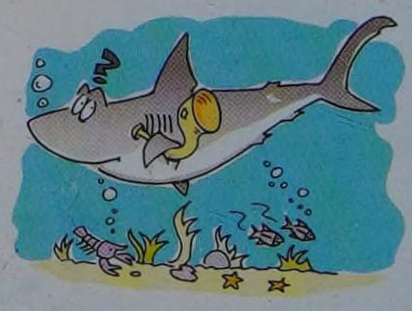
Most sharks have good eyesight, and some can even see in colour. Some sharks have a tapetum – a layer of special cells at the back of the eye that helps them to see in dim light.

It is thought that great white sharks can see in colour.

Some sharks can sniff out a meal from more than 1 km (0.6 mile) away.

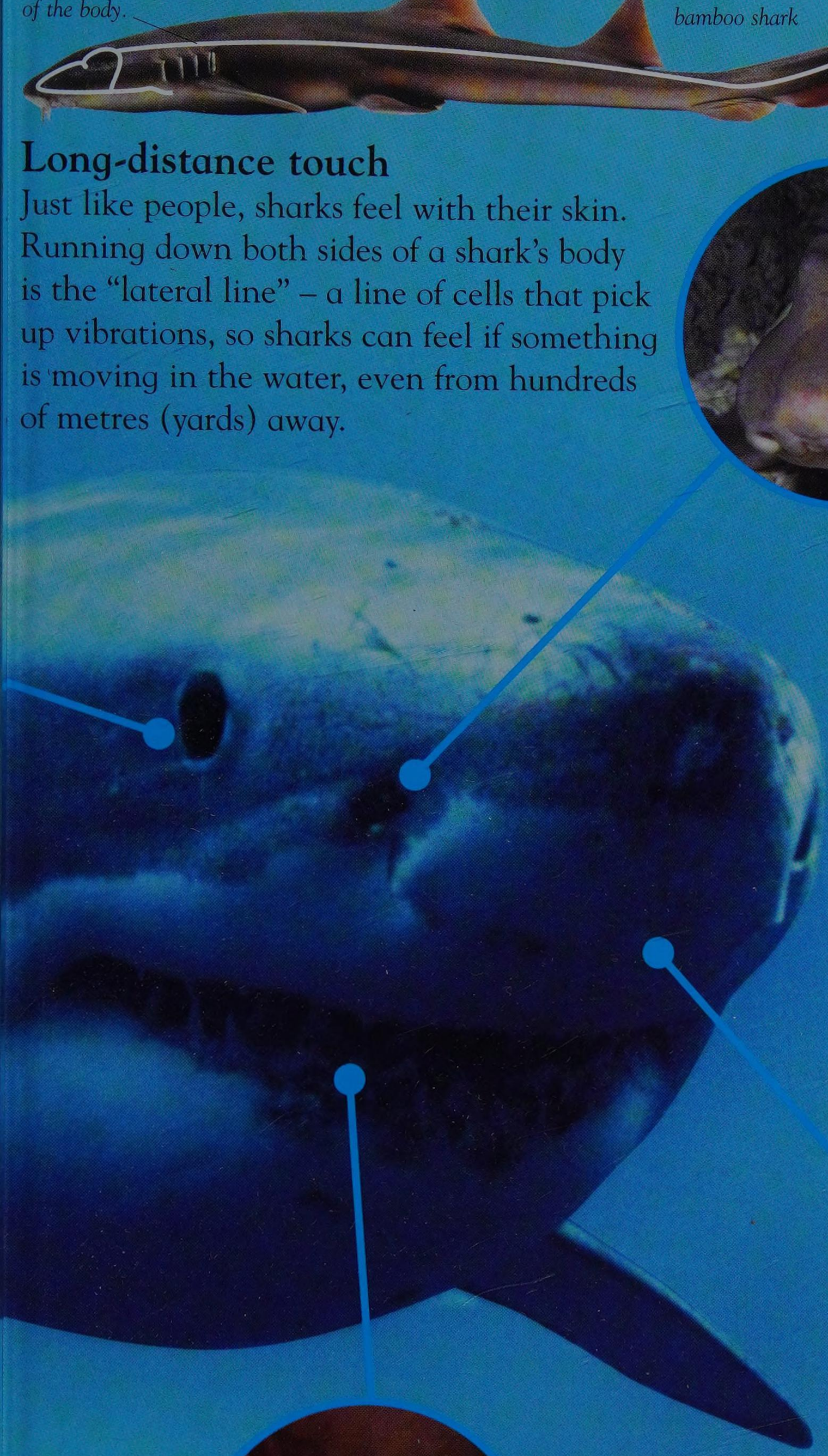
DO SHARKS HAVE EARS?

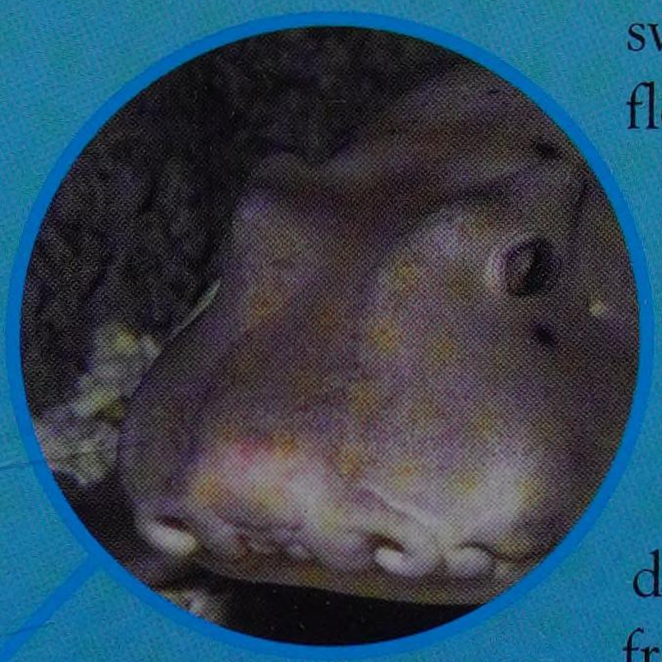
You can't see ears on a shark, but they do have ears inside their heads. Tiny openings in the shark's head, near its brain, pick up sounds that travel through the water. They can even tell which direction the noise is coming from, and from more than a kilometre (0.6 mile) away.



Long-distance touch

Just like people, sharks feel with their skin. Running down both sides of a shark's body is the "lateral line" – a line of cells that pick up vibrations, so sharks can feel if something is moving in the water, even from hundreds of metres (yards) away.



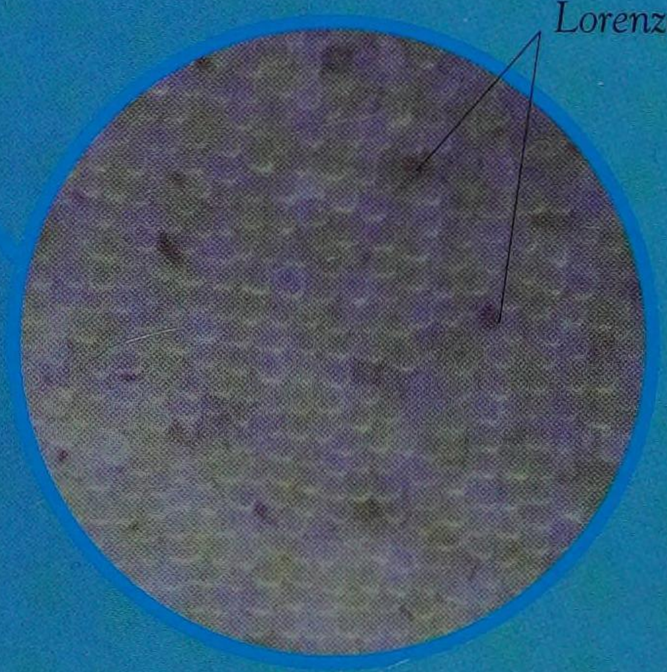


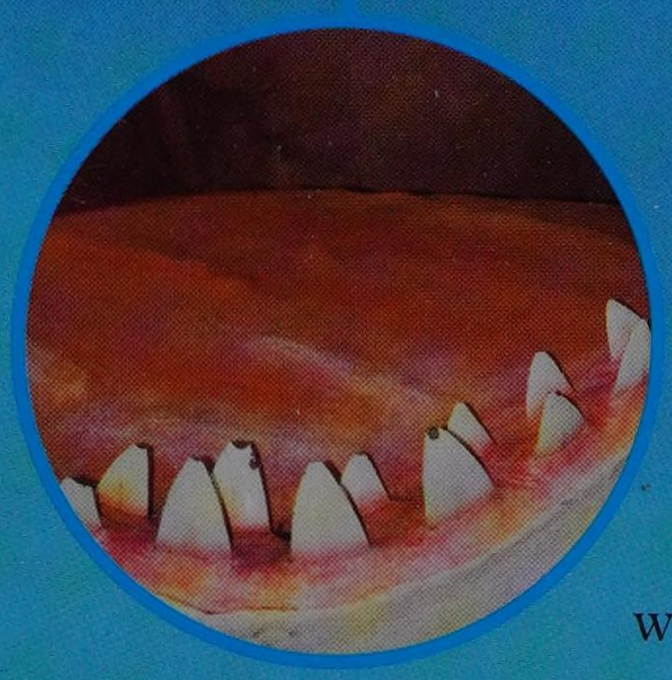
I smell you

Sharks have a much better sense of smell than we do. As a shark swims along, water flows into its nostrils. If there's a fishy smell in the water, the shark will move its head from side to side to find the direction it's coming from. Then it may head off after its prey.

It's electrifying!

All living things give out weak electrical signals. Sharks can pick up these signals through pores on their snout called ampullae of Lorenzini. Using this sense, sharks can detect prey hidden in the sand on the seabed.





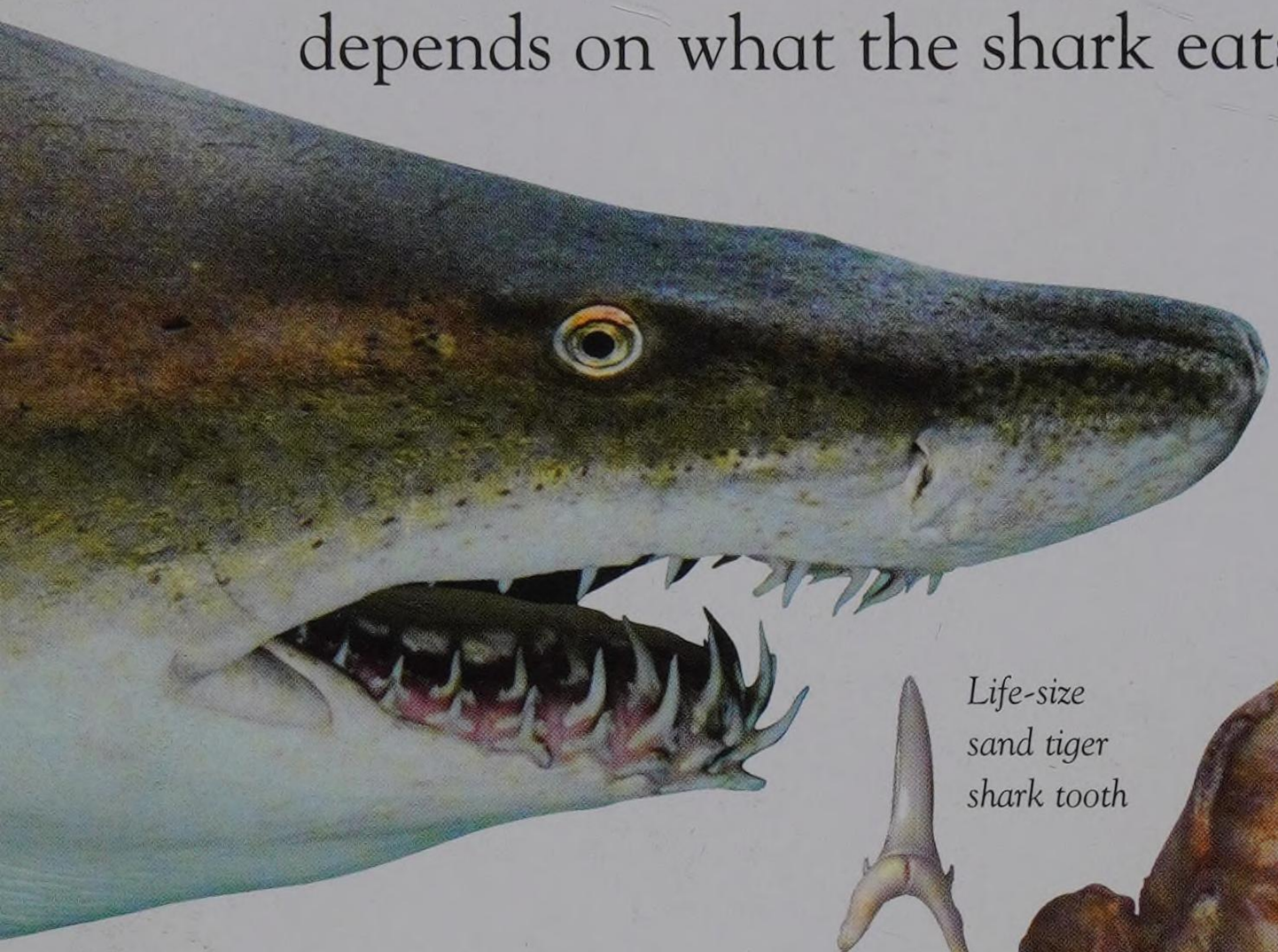
Unlike a human tongue, a shark's small, thick tongue doesn't move very much.

A matter of taste

Sharks have tastebuds inside their mouth, but not on their tongue like people do. Some sharks are fussy eaters and will spit out prey that they don't like – but it may be too late for the prey, which has already been bitten.

Jaws

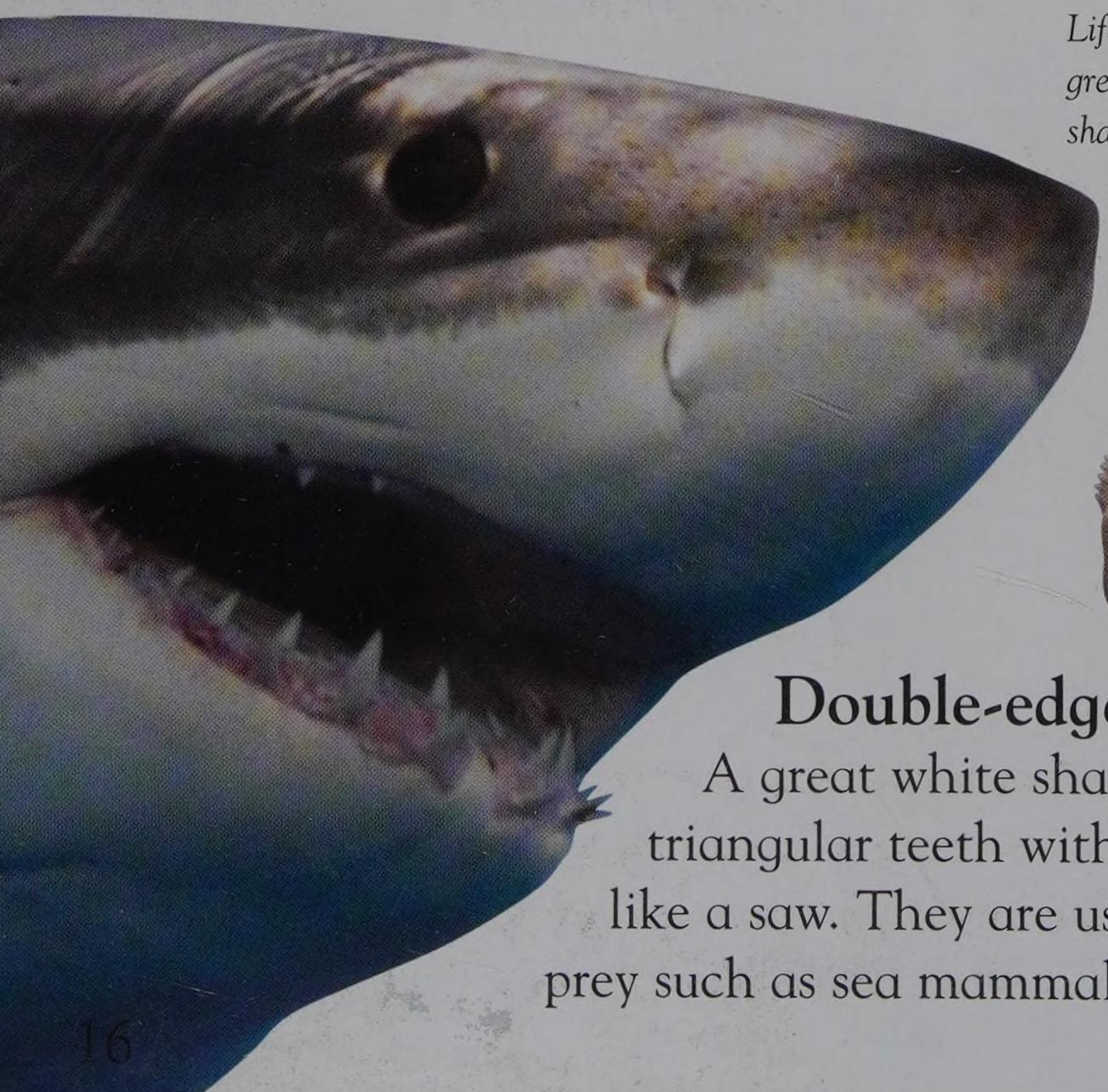
All sharks are carnivorous (they eat meat). Most of them need powerful jaws and sharp teeth to kill their prey. The shape of the teeth depends on what the shark eats.



Life-size sand tiger shark tooth

Sharp as a needle

Sand tiger sharks have pointy teeth for holding onto slippery fish and squid. The uneven rows of curved, needle-sharp teeth gives the sand tiger its other name: the ragged-tooth shark.



Life-size great white shark tooth

Double-edged saw

A great white shark has sharp, triangular teeth with serrated edges, like a saw. They are used for tearing prey such as sea mammals.

A tiger shark's jaws are so strong, it can bite through a turtle's shell.

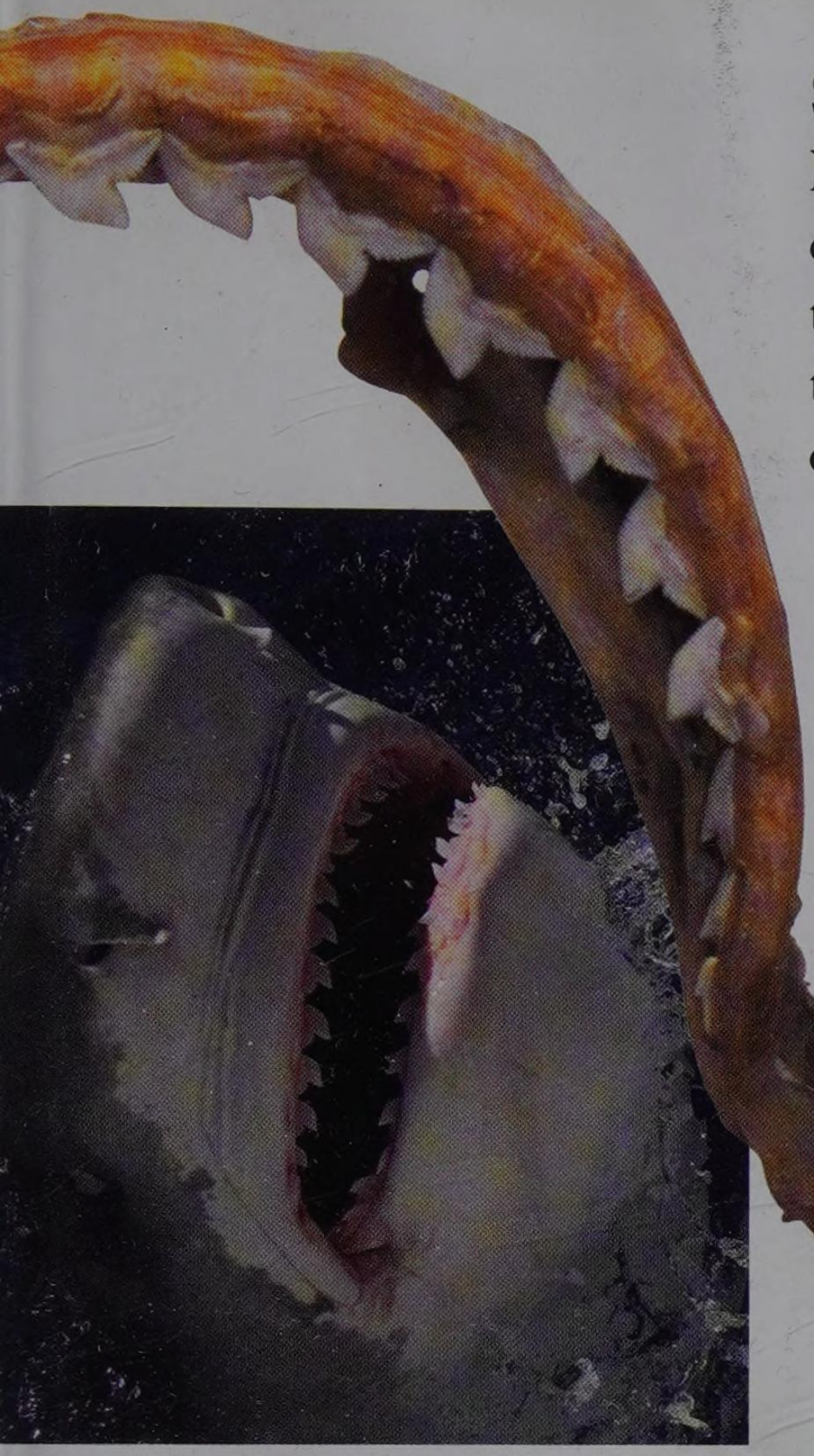
Life-size tiger shark tooth

Terrifying teeth

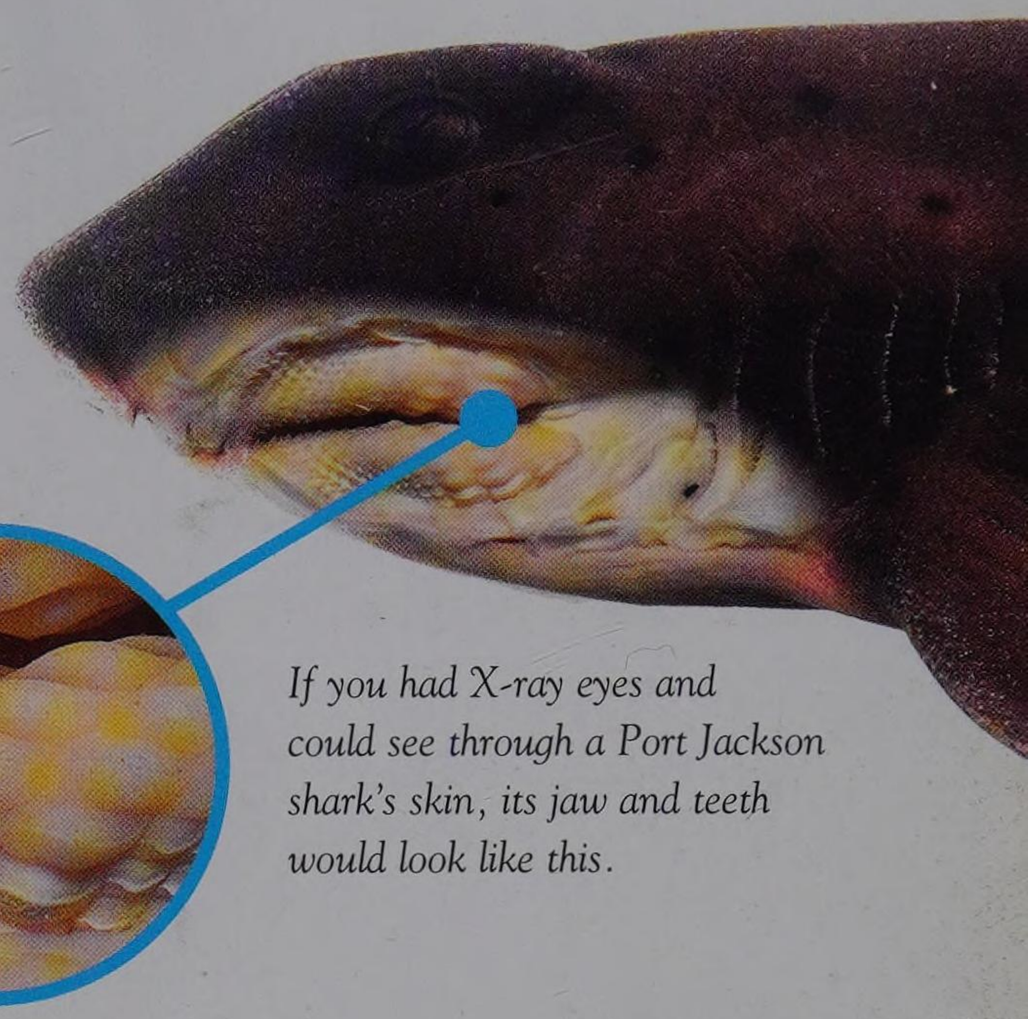
With these fearsome teeth, tiger sharks are able to bite chunks out of almost anything. The sharp point stabs prey, while the jagged edges cut through the flesh of fish and any other animals found in the sea – including even people!

Shell-crushers

Many sharks that live on the seabed have flat teeth at the back of their jaw, used for crushing shellfish.



A tiger shark breaks through the surface of the sea while chasing prey.



If you had X-ray eyes and could see through a Port Jackson shark's skin, its jaw and teeth would look like this.

New teeth, please!

Have you ever lost a tooth? Sharks do, all the time. As soon as a front tooth is worn out or breaks, it is replaced by one in the row behind. Sharks can go through thousands of teeth in a lifetime.

Toothy facts

- Sharks may have up to 3,000 teeth at one time. The biggest teeth are at the front.
- Sharks can push their jaws forwards away from the skull to take much bigger bites than normal.
- Tiger sharks can grow 24,000 teeth in 10 years.

Tiny teeth

Basking sharks are filter feeders – they swallow huge amounts of plankton that live in sea water. The plankton are so small, the shark doesn't need to bite or chew them, so its teeth are hardly used.

Feeding frenzy

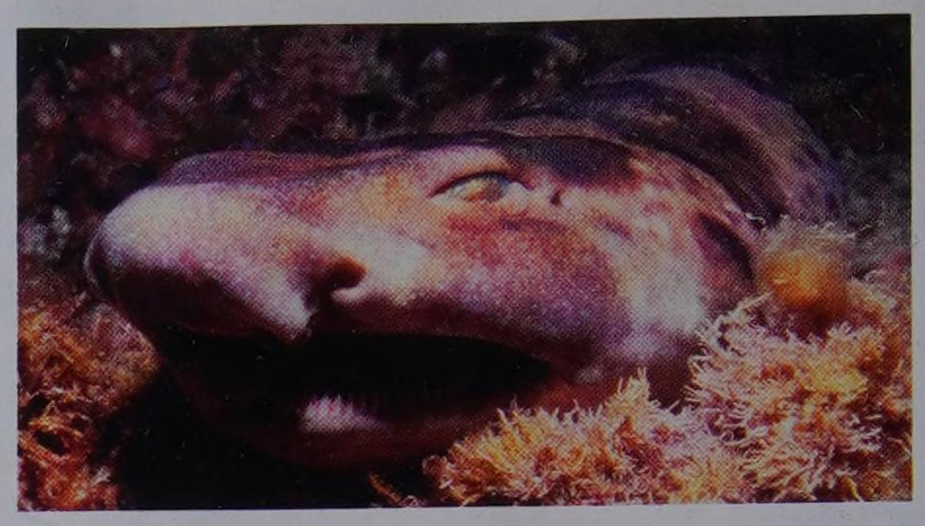
A reef shark picks up the scent of wounded fish in the water. He swims to his prey – but he's not the only shark at the scene. If there is plenty of food about, it could turn into a feeding frenzy!

So many sharks

Feeding frenzies don't often happen in the wild, but if lots of sharks detect the same scent or movement of prey in the water, they may all end up at the same feeding ground. If there's lots of food, the sharks jostle each other in a feeding frenzy.

Sharp cookie

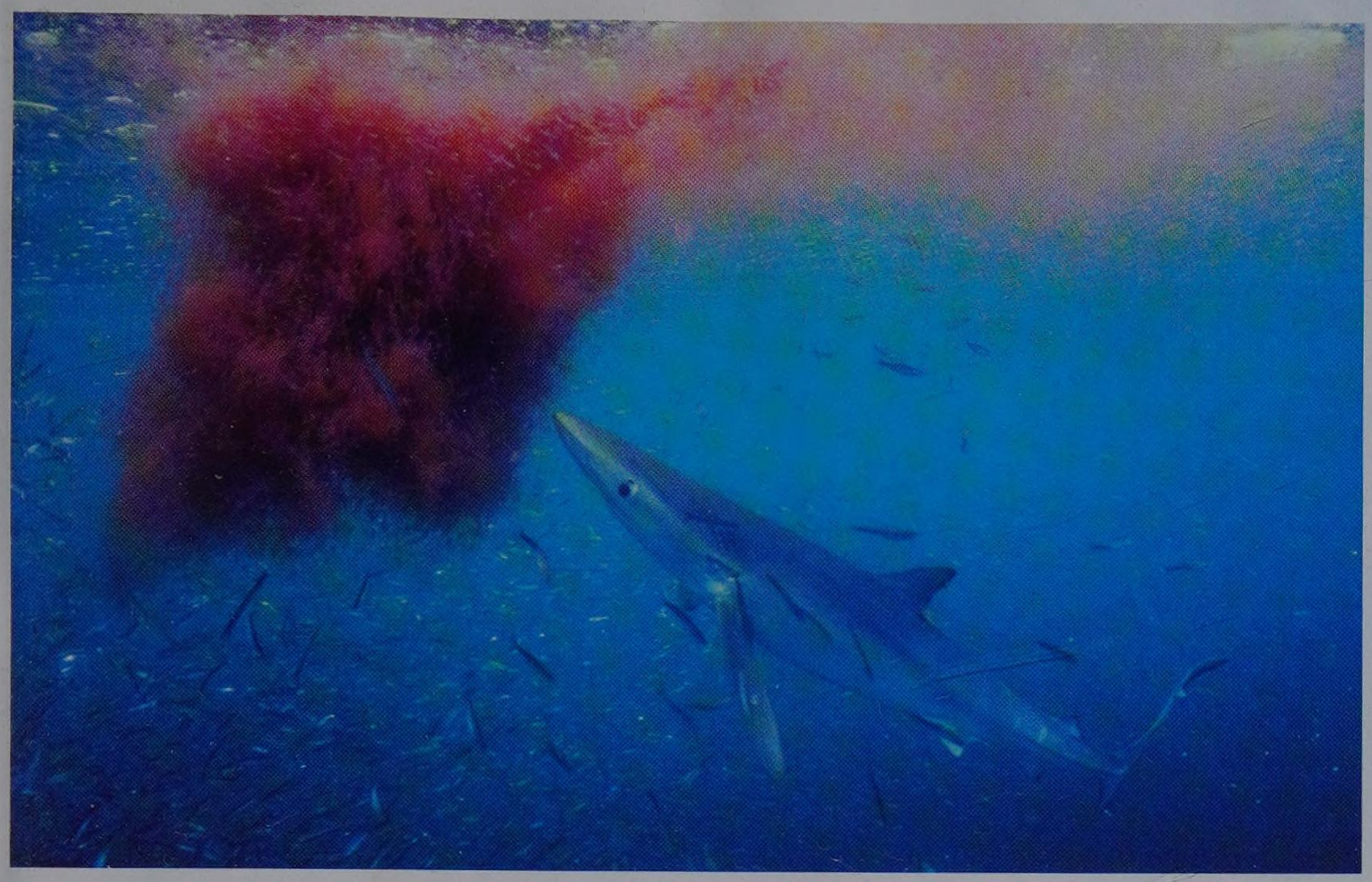
Cookiecutter sharks are named after the round bite marks they make on their prey. These sharks sink their teeth into a dolphin's skin, twist round, and then bite off a chunk of flesh to eat.



A swell surprise

Some sharks catch their prey by ambushing it. Swell sharks hide on the seabed until a fish swims past... then they spring open their jaws and gulp the fish down.

Sharks go for injured prey over



The hunt is on

While some sharks sneak up on their prey, others are more brazen predators. Fast sharks can catch prey after a high-speed chase. Some sharks may also feast on "bait balls". Diving into the bait ball breaks up the fish that pack together for protection.

A blue shark tackles a swarm of krill, which are tiny, shrimp-like animals.

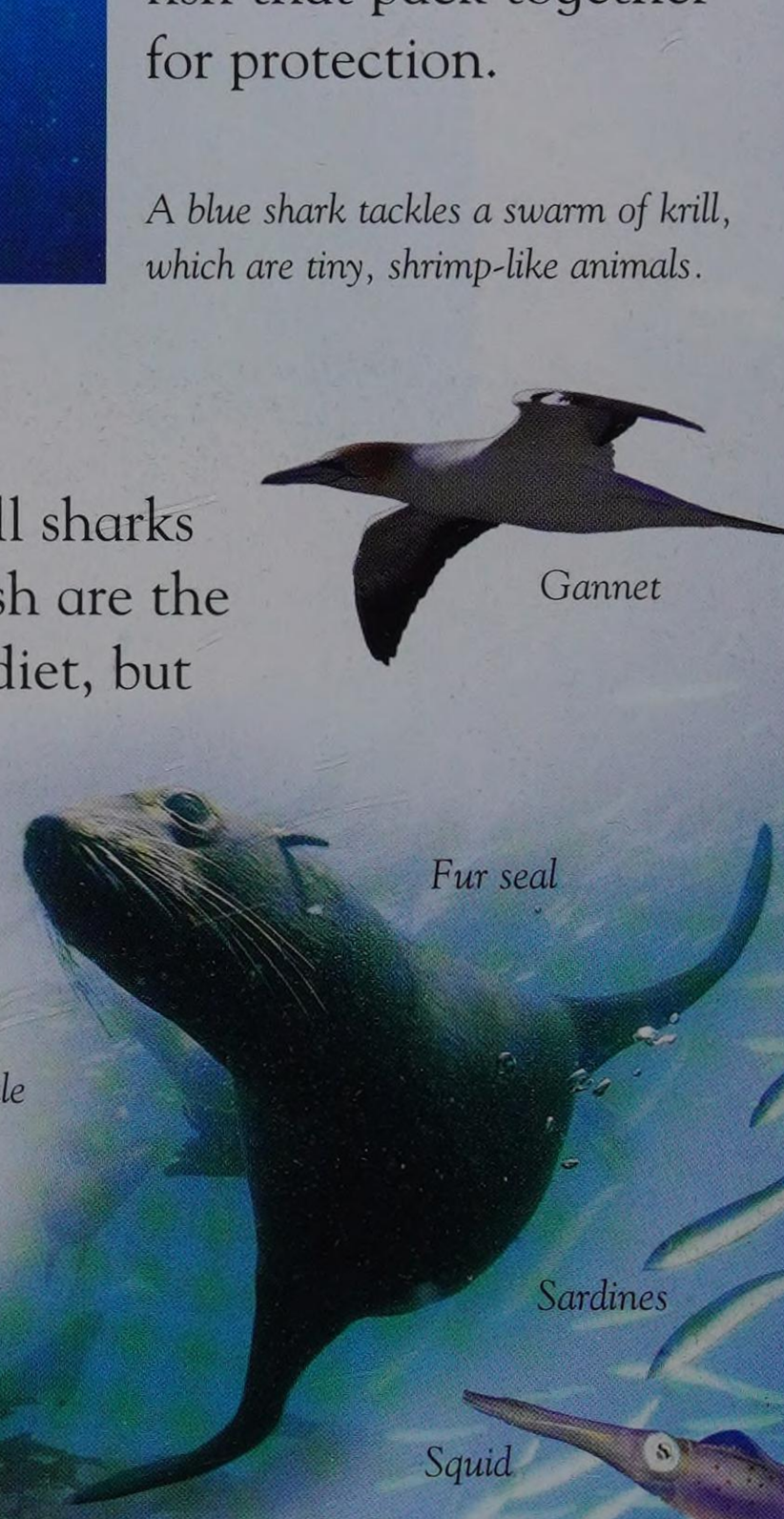
Stingray

On the menu

However they catch it, all sharks eat meat. Fish and shellfish are the main part of most sharks' diet, but some eat seals, sealions, and seabirds too. Larger sharks may also feast on their smaller cousins.

Gannet

Turtle



Fur seal

Sardines

Squid

healthy prey because it's easier to catch.

Stomach that!

Tiger sharks are the dustbins of the sea, hunting prey and scavenging for anything they can find. Scientists have found some very strange "food" in tiger sharks' stomachs.

Stingrays and squid sound quite edible, but tin cans, animal antlers, shoes, car licence plates, car tyres, handbags, and a human hand are not recommended for lunch!

Bottom feeders

Sharks that hunt on or near the ocean floor are known as bottom feeders. Often slow-moving, these sharks probe the seabed for unsuspecting prey, or simply wait for it to come to them.

Angel ambush

Some angel sharks hunt at night, swimming quite far in their search for fish and shellfish. But most angel sharks feed during the day, resting on the seabed and lying in wait for their prey. When a fish swims past, the shark lifts its head and snaps up the prey with its sharp teeth.

Hide and seek

With its flat body and sandy-coloured skin, the angel shark is perfect at hiding on the seabed – even though it can grow to nearly 2 m (6.5 ft) long! It uses its extra large pectoral fins to dig down into the sand.

Angel sharks have eyes on top of their head so they can see while resting.

An ambushing angel shark rears up like a cobra.

Now you see me...

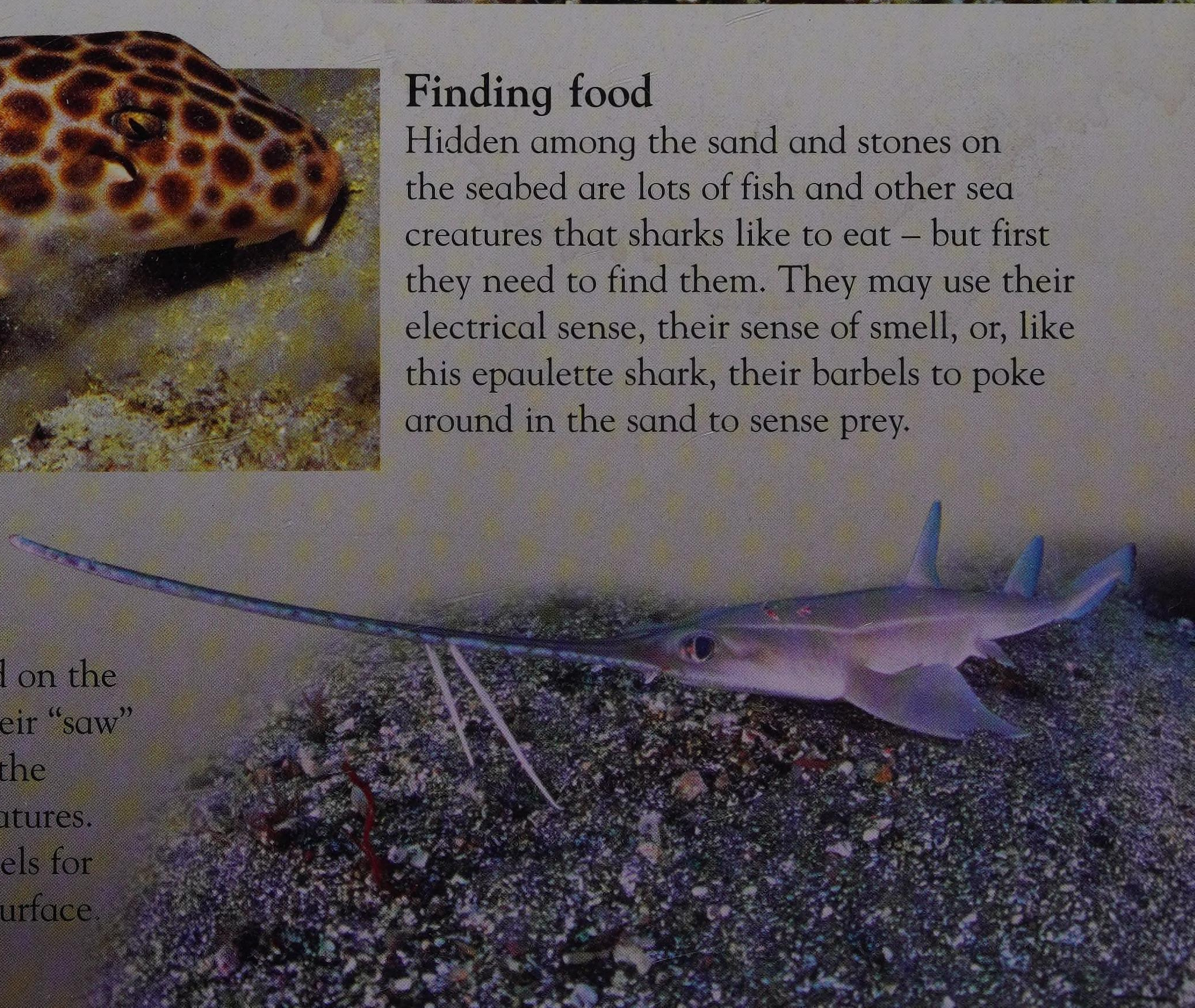
Swell sharks hide in rocky crevices and caves during the day, the pattern on its skin blending in with the stony seabed. The camouflage helps them hide from predators – as a slow swimmer, it might not be able to escape a large, hungry shark.

... Now you don't

Even more camouflaged than a swell shark, a wobbegong settles down among coral. It has fringes of skin around its mouth that look like seaweed. Wobbegongs live along coastlines, and have sometimes been stepped on by swimmers who can't see them.

Finding food

Hidden among the sand and stones on the seabed are lots of fish and other sea creatures that sharks like to eat – but first they need to find them. They may use their electrical sense, their sense of smell, or, like this epaulette shark, their barbels to poke around in the sand to sense prey.



I saw the prey

Saw sharks often feed on the bottom, skimming their "saw" across the surface of the seabed to disturb creatures. They have long barbels for sensing prey on the surface.

Migration

Some sharks like to live in cool water, others in warm water. When summer turns to winter, or winter to summer, the water temperature changes. This is when many sharks migrate.

Migration facts

- Not all sharks migrate long distances. Nurse sharks stay in the same waters all year round.
- Bull sharks are the only common sharks that migrate from salt water oceans far into freshwater rivers to find food.

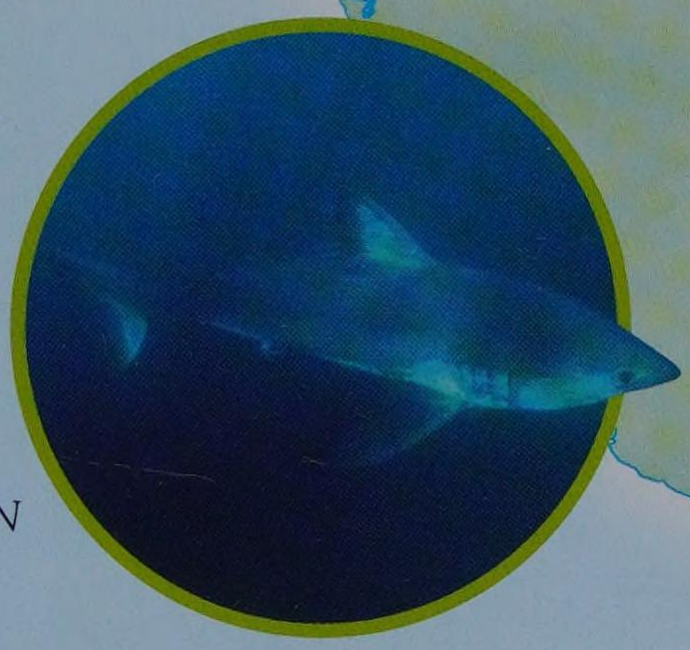
ALASKA

CANADA

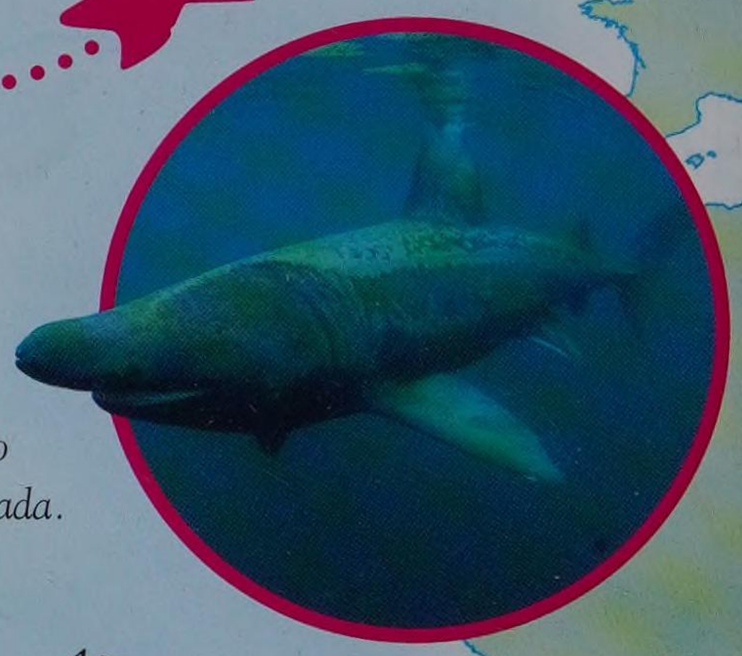
SCOTLAND

HAWAIIAN ISLANDS

ATLANTIC OCEAN



When salmon sharks migrate from cool Alaskan waters to warmer Hawaiian seas, they dive lower so they don't get too hot.



A basking shark that lived near Scotland swam 9,589 km (5,958 miles) across the Atlantic Ocean to Newfoundland, Canada.

Why migrate? For food...

Many species of fish migrate. Sharks that feed on them must follow to find enough food. Other sharks will travel to where their food lives – great whites go to elephant seal colonies in the spring to eat the newborn pups.

How do we know?

Scientists have fitted tags onto some sharks so they can follow their migration routes. The tags collect data such as location, diving depth, and water temperature. Satellites collect the data and beam it down to computers.

Caribbean reef shark

A great white shark, called Nicole by the tagging team, made one of the longest known migrations so far. She swam 11,100 km (6,900 miles) from South Africa to Australia. It took just 99 days. Within six months, she had swum back again!

PACIFIC OCEAN

INDIAN OCEAN

AUSTRALIA

SOUTH AFRICA

... Or to have babies

Some sharks, such as the lemon shark, may also migrate to find a mate or to give birth. Many sharks have "pupping grounds" – areas that they return to when they give birth.

Young sharks

Birds lay eggs, mammals give birth to live young, and sharks… Well, that depends on the species. Some give birth to live young, and some lay eggs.

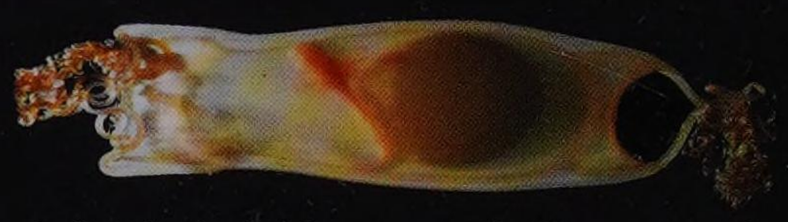
Mermaid's purses

Some dogfish eggs look like leathery bags, which are sometimes called "mermaid's purses". Tendrils at the top and bottom wrap around seaweed to stop the eggs being swept away by ocean currents.

Newly laid soft eggs soon turn hard in the water.

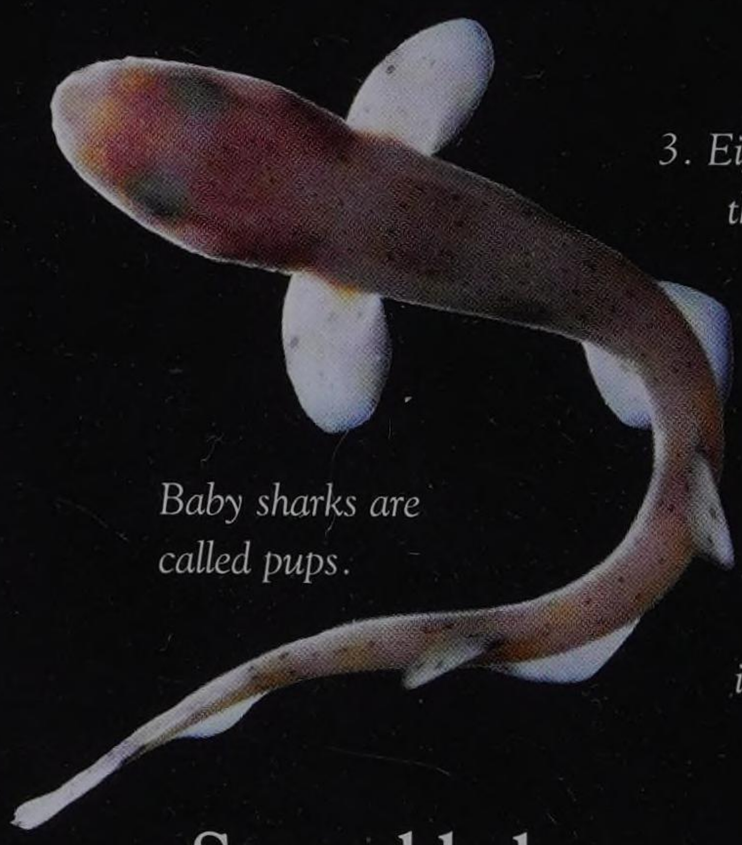
Inside an egg

Sharks' eggs look nothing like birds' eggs, but inside, similar things are happening...



1. Inside the leathery case of a lesser spotted dogfish egg, an embryo starts to form. It is attached to a yolk sac, which contains its food.

2. As it uses up its food, the embryo grows and the yolk shrinks. Water seeps through the egg case, providing oxygen to keep the embryo alive.



Baby sharks are called pups.

3. Eight to nine months after the egg was laid, the dogfish hatches. All sharks are born looking like small versions of adult sharks. Unlike most bony fish, they do not have to change body shape (called metamorphosis) into an adult.

Scrambled eggs

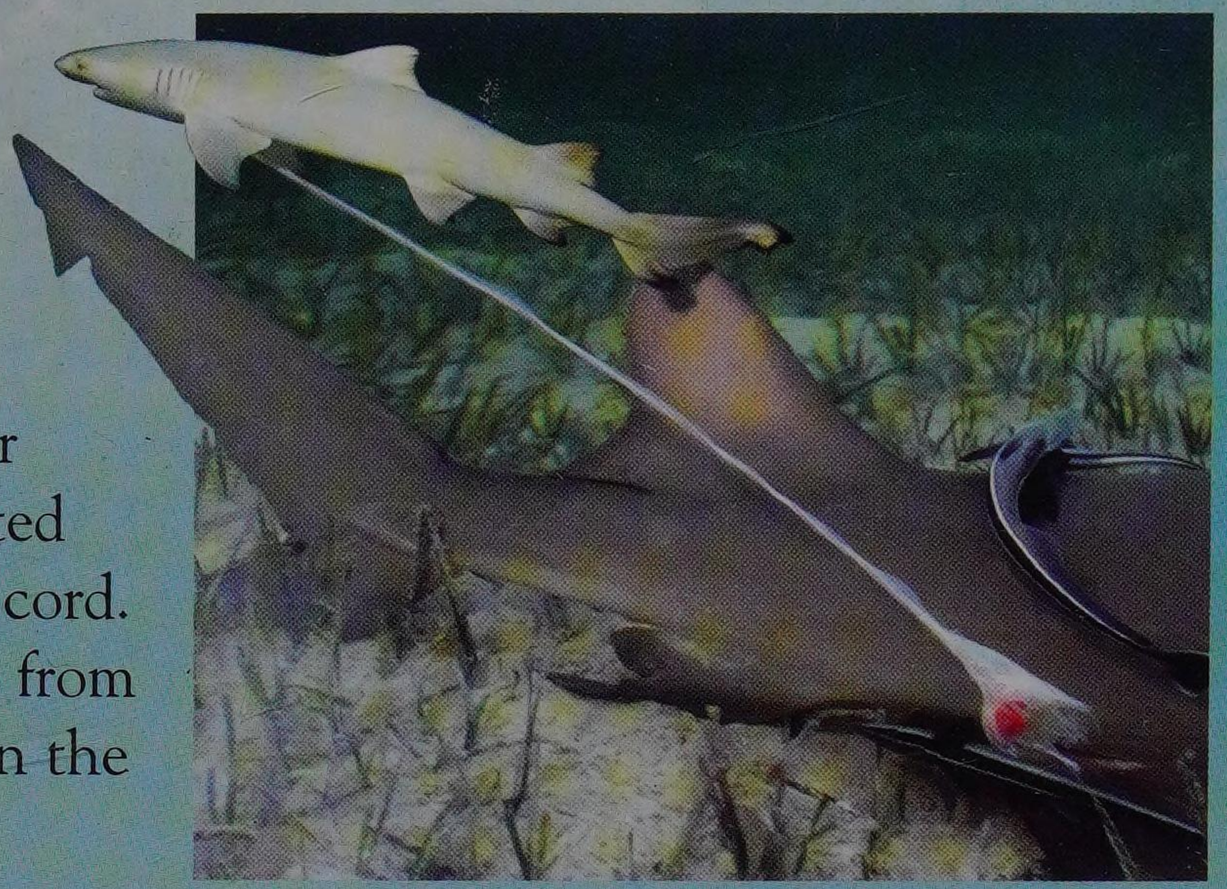
Horn sharks lay spiral-shaped eggs. The unusual shape is useful for wedging among underwater rocks, stopping the eggs being washed away.

Birth facts

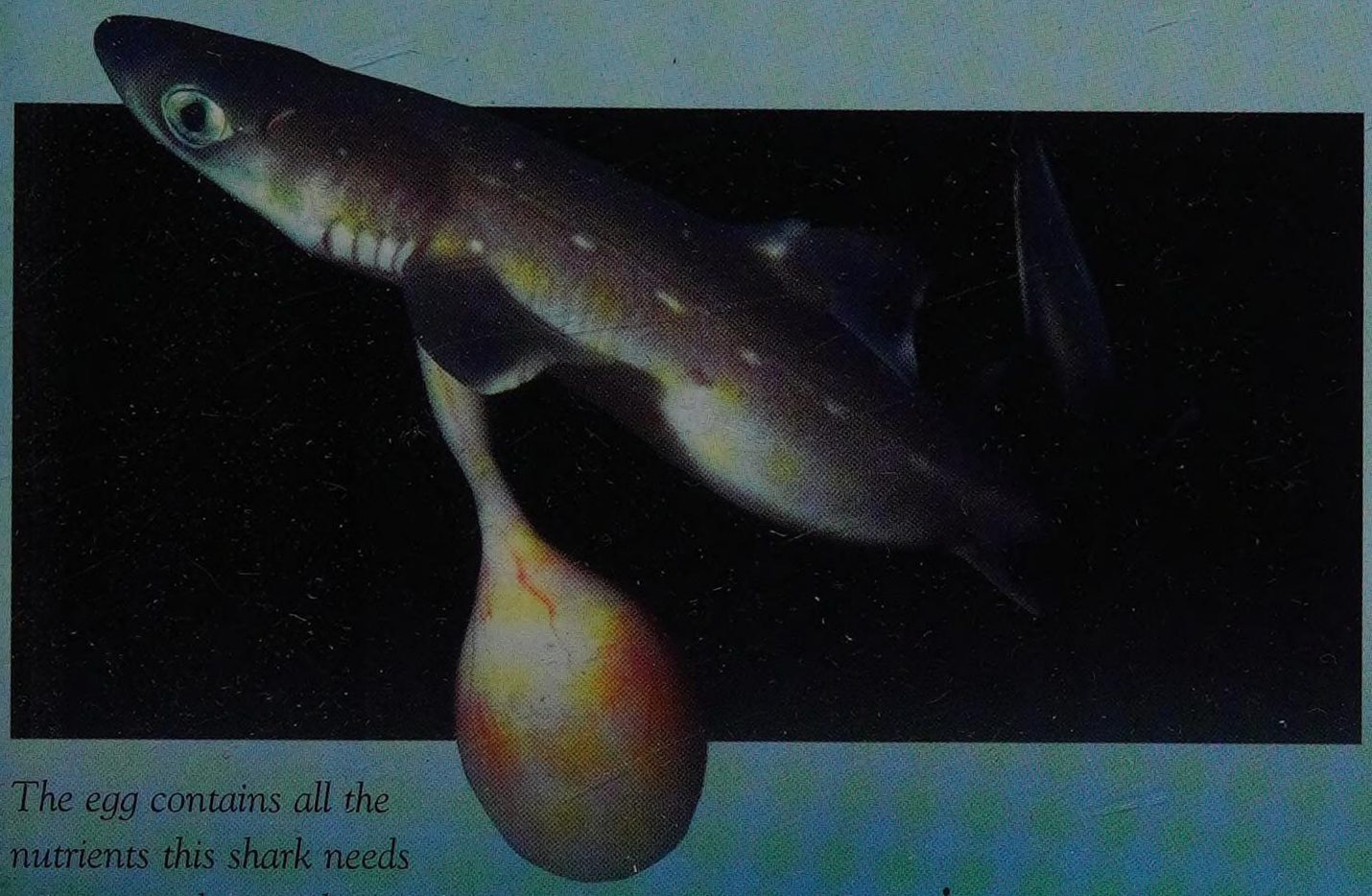
- Lesser spotted dogfish are 10 cm (4 in) long when they hatch.
- Lemon sharks can give birth to up to 17 pups in one litter…
- … But hammerheads might produce up to 40 pups at once.

Live young

Some shark species develop in a similar way to people: they grow inside their mother, connected by an umbilical cord. The cord breaks from the mother when the pup is born.



Lemon sharks



The egg contains all the nutrients this shark needs to grow in the womb.

Egg for breakfast

Most pups develop inside eggs but hatch while they are still inside their mother, so she gives birth to live young. Some sharks, such as spiny dogfish, are born still attached to their egg. They absorb the food from the yolk until it is all used up.

A shark can swim and hunt for food as soon as it is born.

Bye mum!

Lemon sharks give birth in shallow water. The pups come out tail first, and then swim off. Like all shark species, they are not cared for by their mother: they must fend for themselves from the moment they are born.

Attack!

The great white shark sits at the top of the food chain. The 6.5-m- (21-ft-) long predator is dangerous to large fish and hunts mammals such as seals, sealions, and dolphins. It may also attack humans, though this is rare.

Now you see me

What colour is a white shark? Mostly silver grey! Any prey looking up from the bottom of the sea would not see the pale belly of the shark, as it blends in with sunlight reflecting on the surface of the sea.

A burst of speed
and the seal is caught!

It's an ambush!

A great white can't change direction very quickly, so to be a successful hunter, it must surprise its prey. It normally cruises along at a gentle 3 kph (2 mph), but when it finds prey, the shark shoots forwards at 25 kph (15 mph).

Watch out in the water

Is the great white really as dangerous as the film *Jaws* made out? They may kill more people than any other shark species – but attacks don't happen often. More people are killed by jellyfish.

It's thought that most shark attacks on people are really a case of mistaken identity. Seen from below, a surfer on a board looks a lot like a seal – the shark's intended prey.

Big beasts

The whale shark and basking shark are the two largest fish in the world. They may be huge, but they're harmless – unless you're plankton.

A basking shark's gill rakers are long bristles coated in slime.

Sieves of the sea

Basking sharks are filter feeders that eat plankton. They swim with their mouth open, taking in water. As the water flows out through the shark's gills, the plankton get trapped in gill rakers.

Hot food

On sunny days, basking sharks can be seen near the surface of the sea. They are following the plankton, which gather in warm, sunlit water.

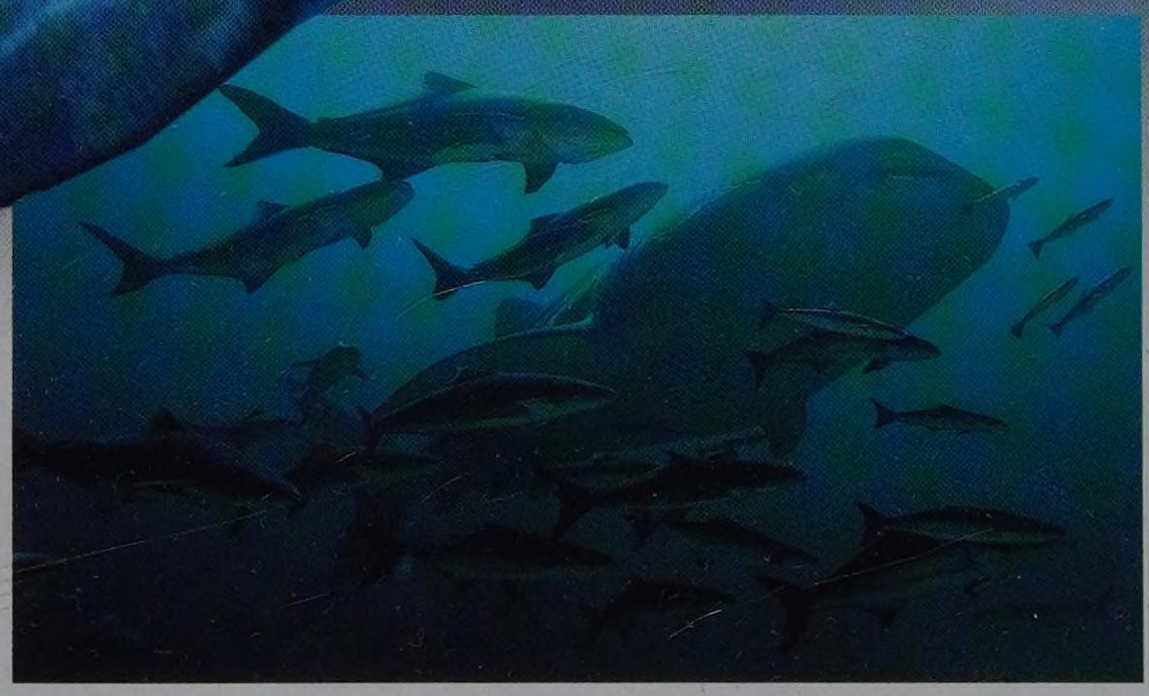
The vacuum cleaner of the sea

A basking shark needs to swim to take in water, but a whale shark simply opens its huge mouth to suck in water. It can filter 6,000 litres (1,500 gallons) of water in an hour – that's the same amount of liquid as in more than 18,000 cans of drink!

A whale shark closes its mouth to swallow food. It can spit out food it doesn't like.

Small fish and squid are easily sucked into the shark's massive mouth.

Plankton is made up of tiny sea creatures and algae.



School patrol

Schools of medium-size fish often attract predators, but this whale shark is no threat to them. The fish have chosen to gather around it because its huge size will stop other sharks from attacking them.

Hammerheads

Scientists can only guess at the reasons behind the hammerhead's uniquely shaped head – but it probably gives the shark super hunting skills.

Scalloped hammerhead

Big brother

There are eight different hammerhead species. Great hammerheads are the biggest, at 6 m (20 ft) long. At just 90 cm (3 ft) long, mallethead sharks are the smallest.

The shark's nostrils are near the ends of its head, effectively giving the shark a big nose! Its sense of smell is thought to be 10 times better than in other sharks.

The shark's eyes are at the very ends of its wide head. As it swims, the shark turns its head from side to side so it can see all around.

Nostril

Big head

Scalloped hammerhead sharks have distinctive dents in the front edge of their heads. These are the most commonly seen of all hammerheads.

Time for school

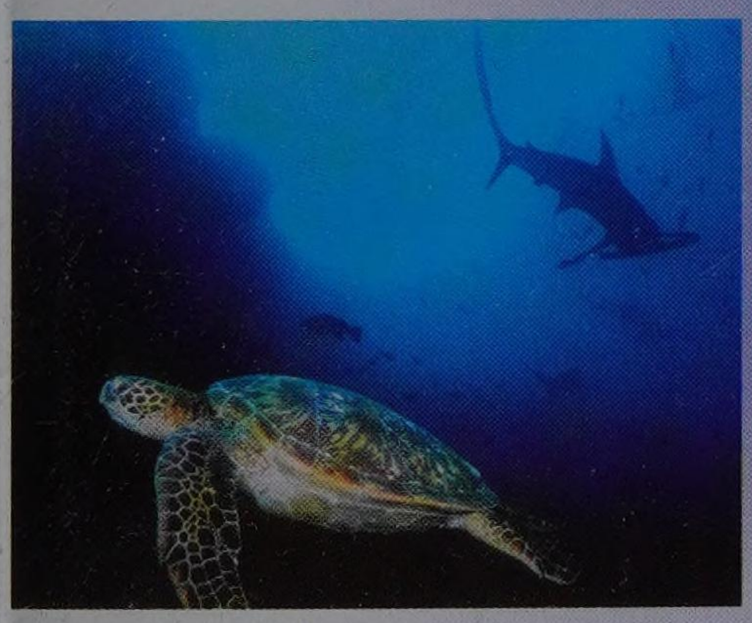
During the day, scalloped hammerheads sometimes gather in large schools. Nobody knows why they do this. When night falls, they go off by themselves to hunt for food.

Hammerhead facts

- These sharks like to live in warm waters around the coast.
- Many hammerheads migrate huge distances to reach feeding or breeding grounds.
- The shark's wide, flat head may act like a wing, giving the shark lift as it swims along.

Daring dentist

Carnivorous sharks can make friends! A barberfish eats food left in the shark's teeth, but it's not in danger: it keeps the shark clean, so it's left alone to do its job – and gets a free meal!



Hungry hunters

Hammerheads eat all kinds of fish, including stingrays and even other sharks. They will attack turtles if given the opportunity, snapping off a flipper as a snack.

Relative rays

In the fish family tree, the nearest relatives to sharks are rays. As in sharks, their skeletons are made of cartilage, not bone.

Ray facts

- A stingray's spike can grow to 37 cm (14 in) long.
- The smallest stingray is the size of a human hand, but the biggest can grow to 2 m (6 ft) across.
- Manta rays can grow to 7 m (23 ft) across. Just like the biggest sharks, these huge rays are filter feeders.

Some stingrays have as many as seven spines on their tail.

Stingray

Most rays are not dangerous – but stingrays come with a deadly weapon: a razor-sharp spine that grows out of its tail. They use this in defence against predators, injecting them with poison that comes from a gland below the spine.

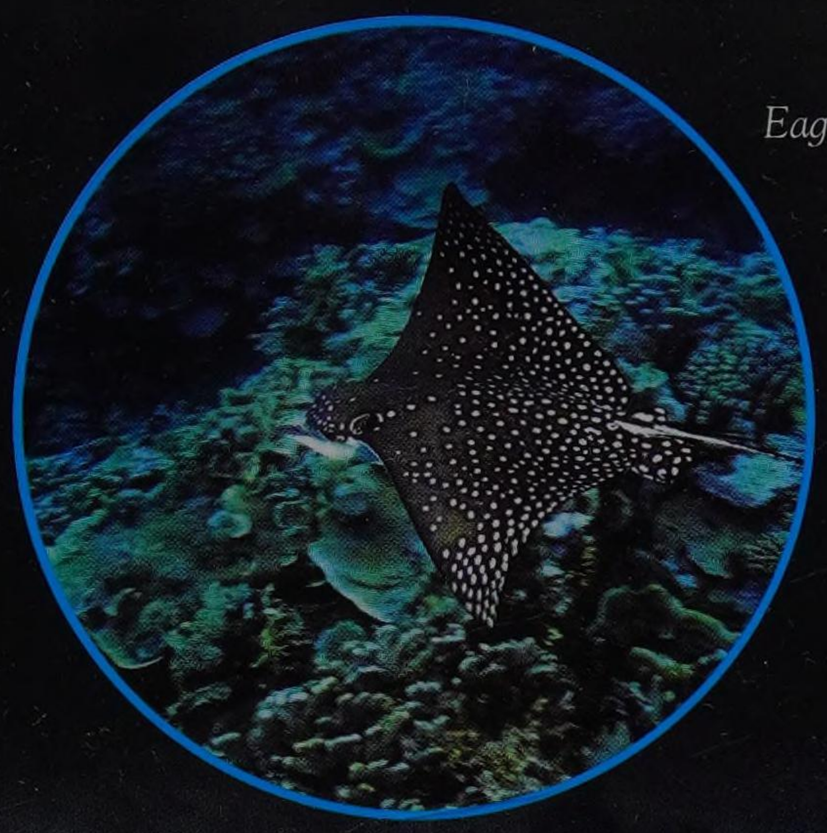
Fish with wings

Unlike sharks, most rays do not swim by waving their tail – it's too small and spindly. Instead, they flap their pectoral fins up and down. The fins are also known as wings.

Manta ray

How to spot a ray

Rays are often spotted or patterned to blend in with the seabed. Their eyes are on the top of their head, but their mouth is underneath.



Eagle rays

Most stingrays like to live in shallow water.

Distant cousin

Chimaeras are also cartilaginous fish. They have a very sharp dorsal fin, which can cause injury to people. A long, pointy tail gives this chimaera its other name: ratfish.

A TASTE FOR SHARP FOOD

With their sharp, poisonous spines, who would want to eat stingrays? Hammerhead sharks! Stingrays are among their favourite food, and the spines don't seem to hurt them. Some great hammerheads have been found with more than 50 spines embedded in the mouth and throat.

Hangers on

Who would want to hang around with killer sharks? There are some fish that like to: remoras use them to hitch a lift, and pilot fish like them as their big bodyguards. But other small hitchhikers are not so friendly.

Using its head

Remoras can swim for themselves, but why make the effort when they can hitch a lift from a shark or a ray? The hard pad on top of a remora's head acts as a sucker for gripping onto the shark.

You scratch my back...

Remoras return the favour to their hosts by cleaning them – they eat the itchy parasites that live on the shark's skin. However, they steal a few scraps from the shark's meal too!

Remoras eat any food that falls out of the whale shark's mouth.

The ridges in the suction pad give grip, just like the tread on a pair of trainers.

You can't catch me!

Pilot fish like to swim with sharks. These small fish may choose to swim with larger sharks because it stops other predators from attacking them. The shark won't harm them either – they're too quick to be caught.

Pilot fish feed on the shark's parasites – and its dung!

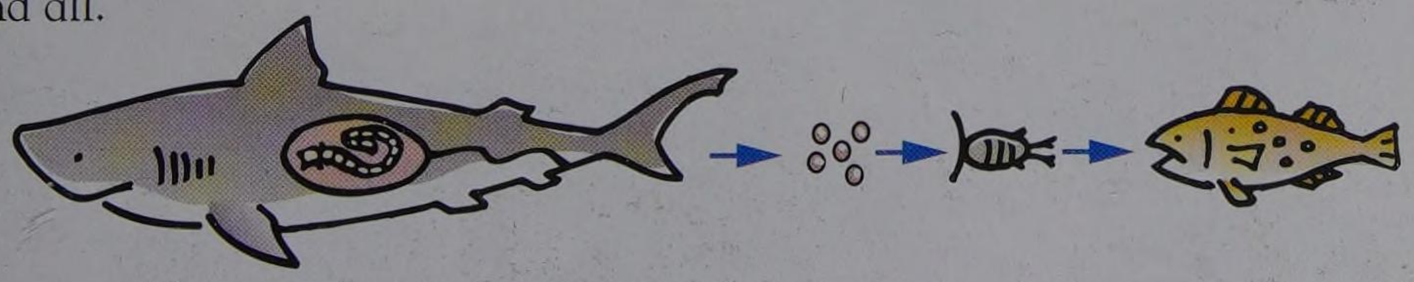
Streaming behind

It's not just fish that hang around with sharks. Some copepods (crustaceans, like crabs and lobsters) stick onto sharks' fins. The females may trail long egg cases behind them. The young hatch into the water.

Female copepods often have darker shells than the males.

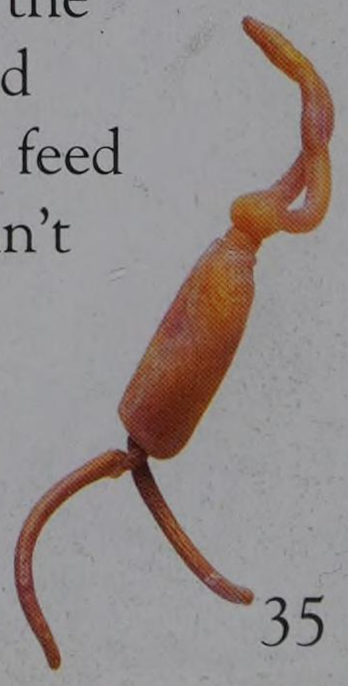
THE STORY OF A TAPEWORM

Tapeworms more than 1 m (3 ft) long can live inside a shark's gut, absorbing food. But how do they get there? A tapeworm lays eggs, which the shark passes into the sea. A copepod eats the eggs, which hatch, and then a bony fish eats the copepod. Finally, a shark eats the bony fish – baby tapeworm and all.



Not so friendly

Another type of copepod chooses to live in the eye of a Greenland shark. It comes to feed on the eye, but can't swim away again. It stops the shark from being able to see properly.



Hunting sharks

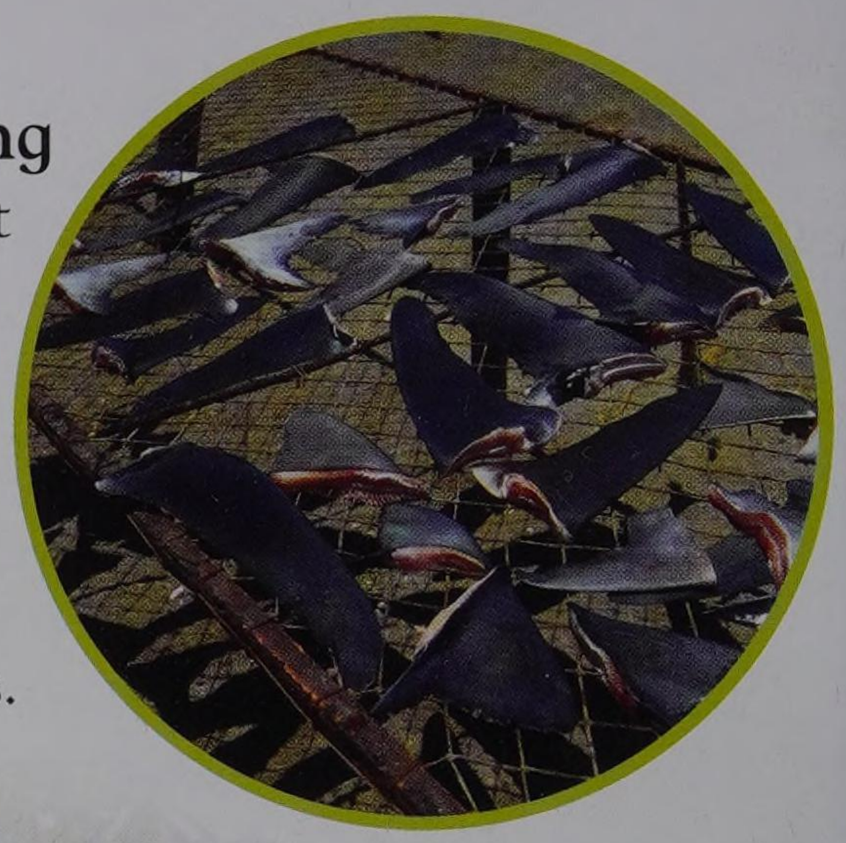
Sharks' flesh, fins, skin, teeth, and oil are used in all sorts of things that many people want, from food to jewellery. Every year, tens of millions of sharks are killed to satisfy our demands.

Shark products

- Shark cartilage and fins are used in traditional medicine.
- Shark skin is turned into leather for making shoes, handbags, wallets, and even sword handles.
- Shark liver oil, called squalene, is used in cosmetics.
- Sharks are also hunted for sport.

A sad ending

Most sharks are caught just for their fins. Some are "finned" while still alive, then thrown back into the sea. Unable to swim, they either drown or are killed by predators.



An essential ingredient?

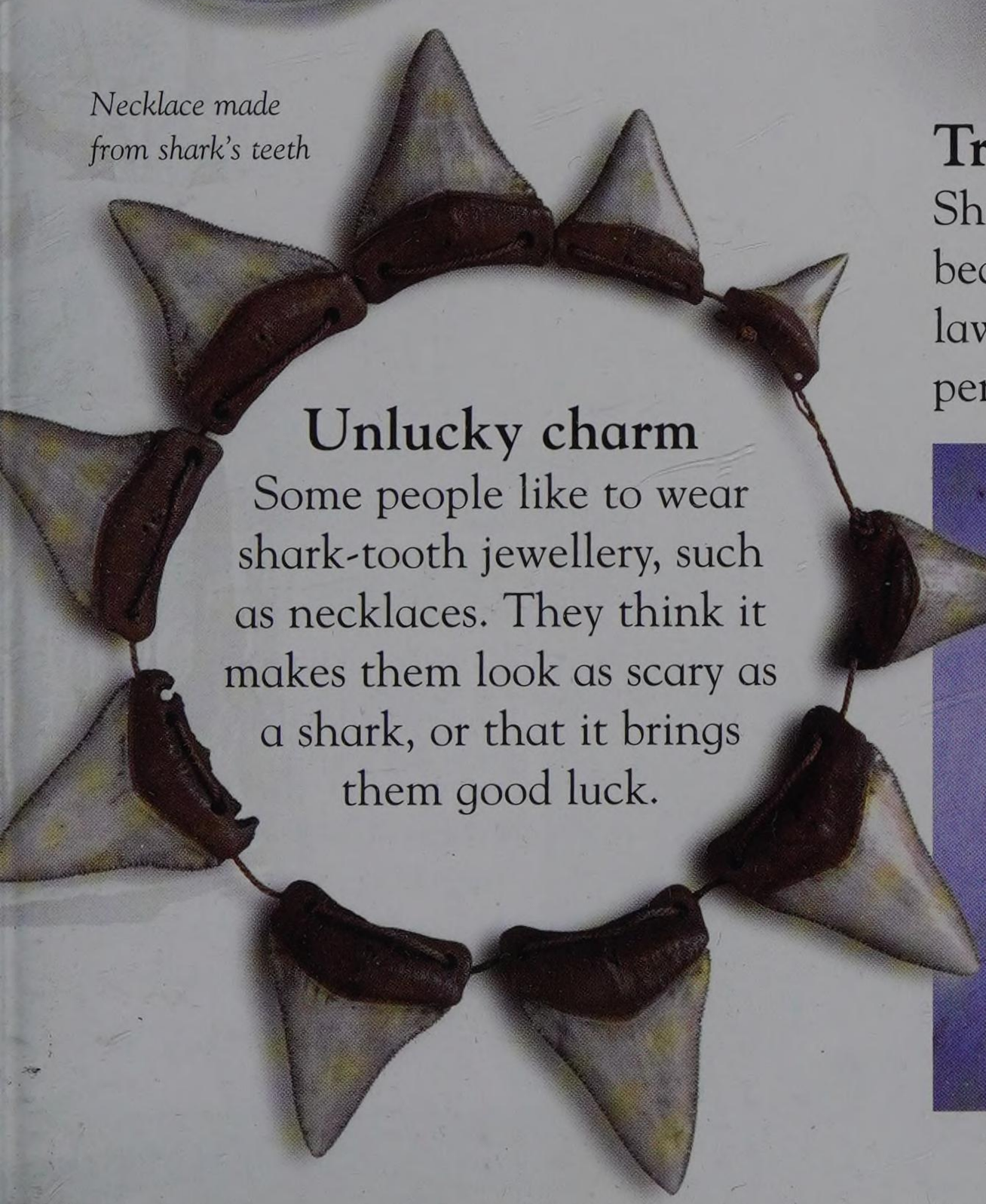
Stripped of skin and rubbed with salt, shark flesh is hung up to dry in the sun. In poorer countries, shark meat can provide important protein. In some other countries, fresh shark meat is sold in markets alongside other fish.

Steak or soup?

In some parts of Europe and North and South America, shark meat is sold as a delicacy. In China, giving a guest shark fin soup is a great honour – but not for the shark. Around 100 different species are caught for their fins, used in making the soup.

Shark fin soup

Necklace made from shark's teeth



Unlucky charm

Some people like to wear shark-tooth jewellery, such as necklaces. They think it makes them look as scary as a shark, or that it brings them good luck.

Mako shark steaks are sold in some supermarkets.

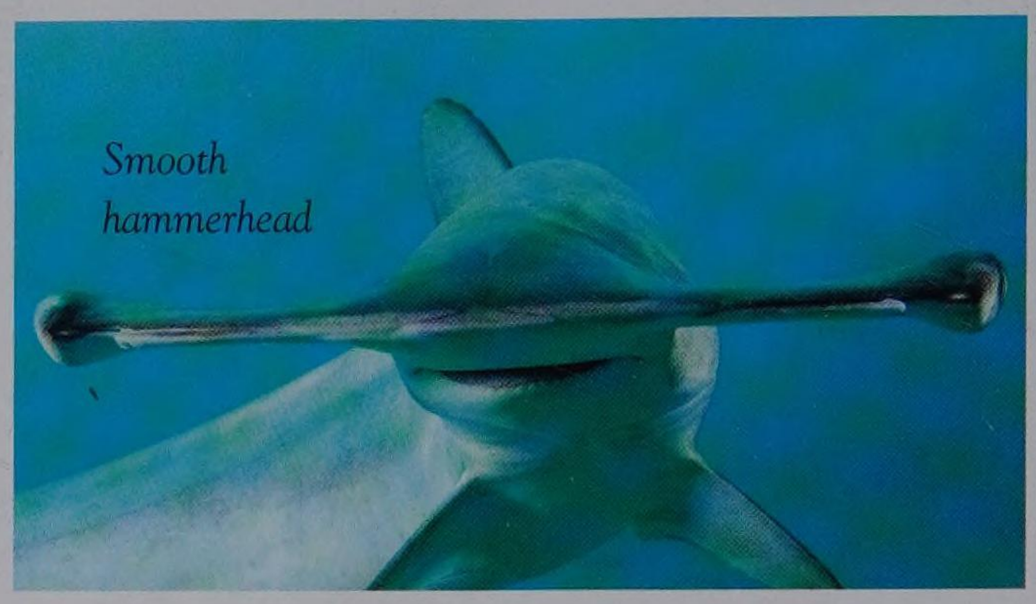
Greenland shark meat is popular in northern Europe.

Trading teeth

Shark jaws are sold as souvenirs in many beach resorts, but you might be breaking the law by bringing one home. Some species need permits to be sold from one country to another.

Endangered species

Sharks are important animals: they help maintain a balance of other fish and animals in the oceans. But sharks are in trouble. More than 100 shark species are threatened, including great white, hammerhead, and whale sharks.

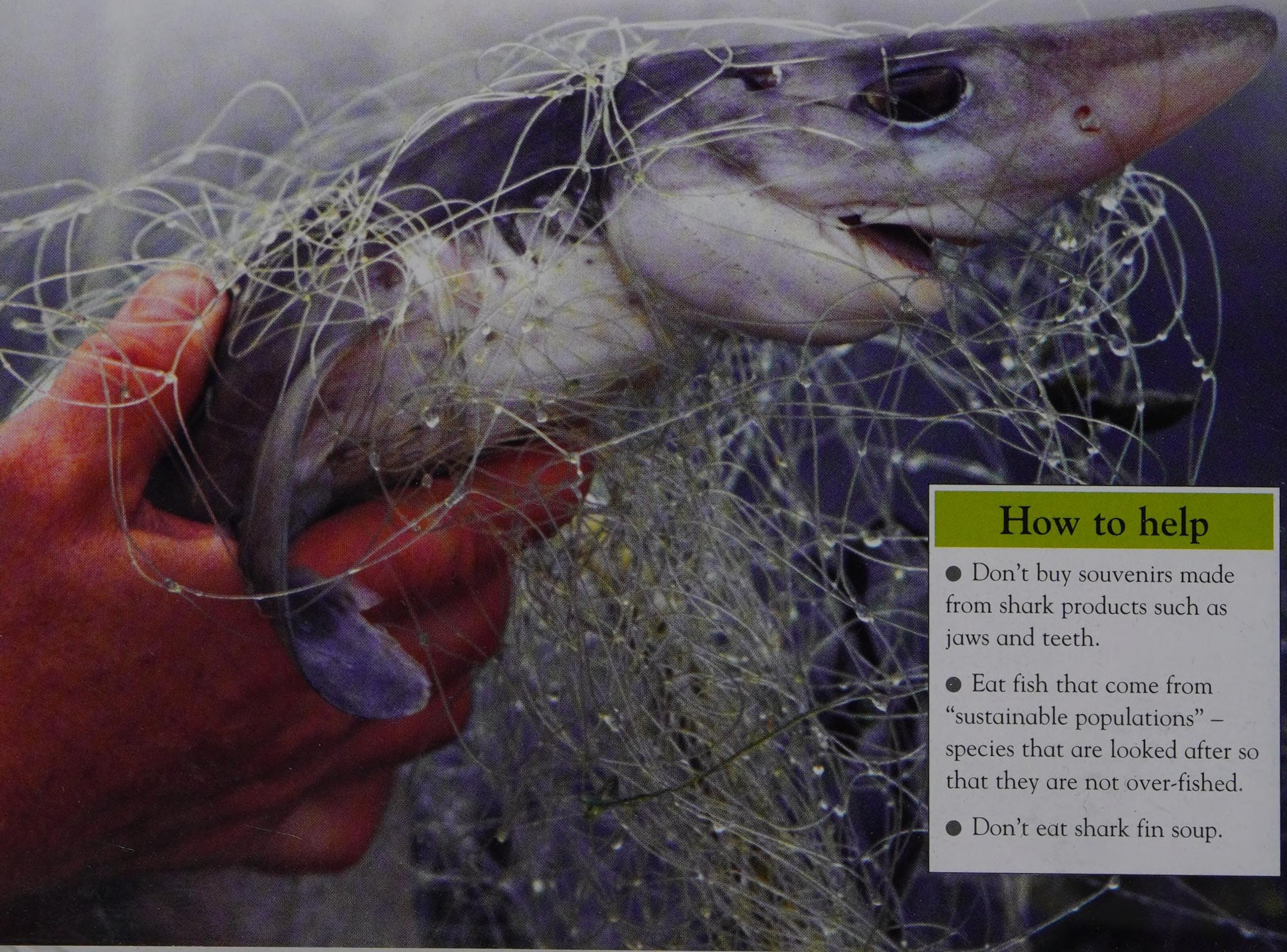


Off the menu

People are the biggest threat to sharks. Spiny dogfish was once very common in European waters, but so many have been caught for their meat, it is now locally endangered. The shark meat is sold in UK fish and chip shops as "rock salmon".

A great expense

Almost all of the eight hammerhead species are at risk. Some are caught on purpose, others accidentally along with other fish. Their fins are among the most expensive of shark fins when sold.



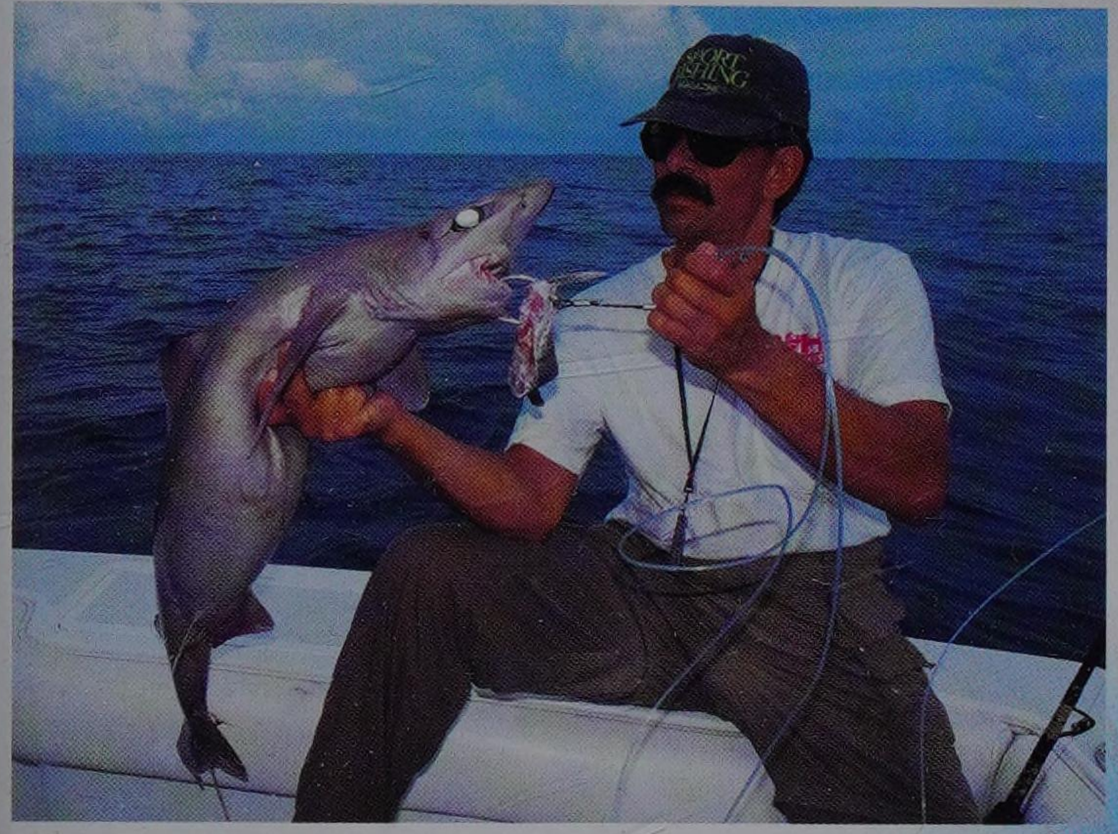
How to help

- Don't buy souvenirs made from shark products such as jaws and teeth.
- Eat fish that come from "sustainable populations" – species that are looked after so that they are not over-fished.
- Don't eat shark fin soup.

Not enough pups

Many sharks, including sand tigers, give birth to only two pups every other year. This means that for some species, there are not enough pups being born to replace the sharks being caught.

A young sand tiger



Not very sporting

Rare gulper sharks are fished for their meat and oil – and on top of that, they are also hunted by anglers. Gulpers fight against the fishing line, which makes anglers want to catch one to show off their skills.

Long, drifting gill nets are illegal, but are still used in the Indian and Pacific oceans.

Bye-bye, bycatch

Thresher sharks, among many other species, are at risk because they get caught as "bycatch" – caught in nets that are laid to catch other fish. Unable to swim away, they suffocate. They may be sold, finned, or thrown back into the sea.

A DYING BREED?

There are around 20 species of sharks known to be at risk of extinction – and possibly more that we don't know about. Ganges sharks are critically endangered. They have been over-fished, and their home – the Ganges River, in India – is polluted. People have also built dams, which stop the sharks swimming freely.

Diving with sharks

Coming face to face with a shark can be terrifying. For surfers and swimmers, a hungry shark is the last thing they want to meet. But for some people, it's all in a day's work.

Cameras have special plastic cases to make them waterproof.

Divers use SCUBA gear to breathe underwater. The tanks contain air, which the diver breathes in through a regulator.

Diving cages can protect people from even the most dangerous shark

Studying sharks

Marine biologists are scientists who study sea life. They tag sharks to track them and learn about shark behaviour.

1 A mako shark is lifted out of the sea to be tagged. A tube pumps water down its throat and over its gills to provide oxygen.

2 A tag is fitted to the shark's dorsal fin. It's thought this doesn't hurt the shark – it's a bit like having your ears pierced.

3 The cradle is lowered back into the sea and the shark swims away. The tag will record where the shark goes.

Come here!

Before someone can tag or photograph a shark, they need to find one. This can be tricky in a vast ocean, so people attract sharks using chum (chopped-up fish) or seal-shaped lures.

Behind bars

Scientists, photographers, and even tourists can dive in cages to get closer to sharks. Lured by bait, the shark approaches, but can't get in.

– the great white.

Sharks from the past

Sharks are even older than dinosaurs! The first sharks swam the seas around 450 million years ago – long before reptiles, birds, and mammals appeared on Earth. (And 200 million years before the dinosaurs.)

In the beginning

With fossils dating back to 370 million years ago, *Cladoselache* is thought to be one of the first sharks. It was around 1.2 m (4 ft) long, and had a tail shape similar to that of a mako or a great white shark.

Life-size Megalodon *tooth*

The Megalodon's *jaw is huge compared to a great white's jaw.*

Great white shark jaw

The big one

Possibly the most famous ancient shark is the *Megalodon*, which lived from around 20 million to 2 million years ago. No whole *Megalodon* fossils have been found, so we don't really know what it looked like.

Based on the size of its huge jaw, it's thought that Megalodon *reached 16 m (52 ft) long.*

The modern ones

Some scientists think catsharks, bullheads, and cow sharks are closely related to the earliest modern sharks, which first appeared 200 million years ago.

This catshark fossil shows that modern catsharks haven't changed much.

The spiky one

This prickly character, called *Stethacanthus*, lived around 300 million years ago. The spiny denticles on its head may have been used in defence. The 2-m- (6-ft-) long shark would certainly be a difficult meal to swallow.

This model shows how Stethacanthus *may have looked.*

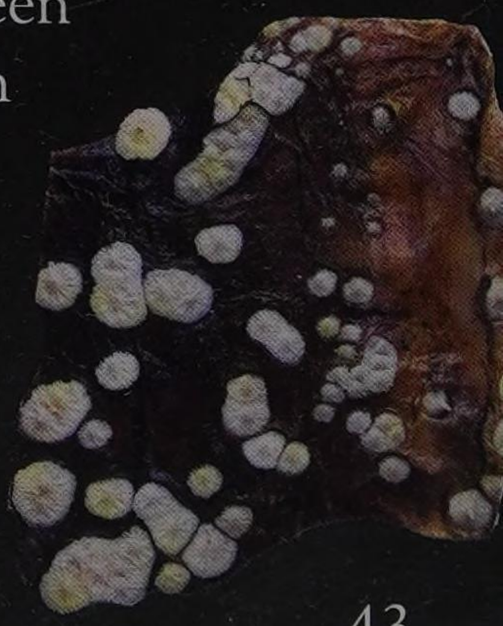
How fossils form

Palaeontologists (scientists who study the past) use fossils to learn about life in ancient times. Shark fossils form when a dead shark at the bottom of the sea gets covered in sand and mud. The soft parts rot away, but the harder parts, such as teeth, remain. Over time, the mud turns to rock. The shark's remains are replaced by minerals, forming a fossil.

The shark dies… *… and gets buried.* *The teeth fossilize.*

Finding fossils

Around 3,000 extinct kinds of shark are known from discovered fossils. Many have been found on land, which in ancient times would have been underwater. Lots of fossils are of teeth, but the oldest ones are of skin denticles.



Weird and wonderful

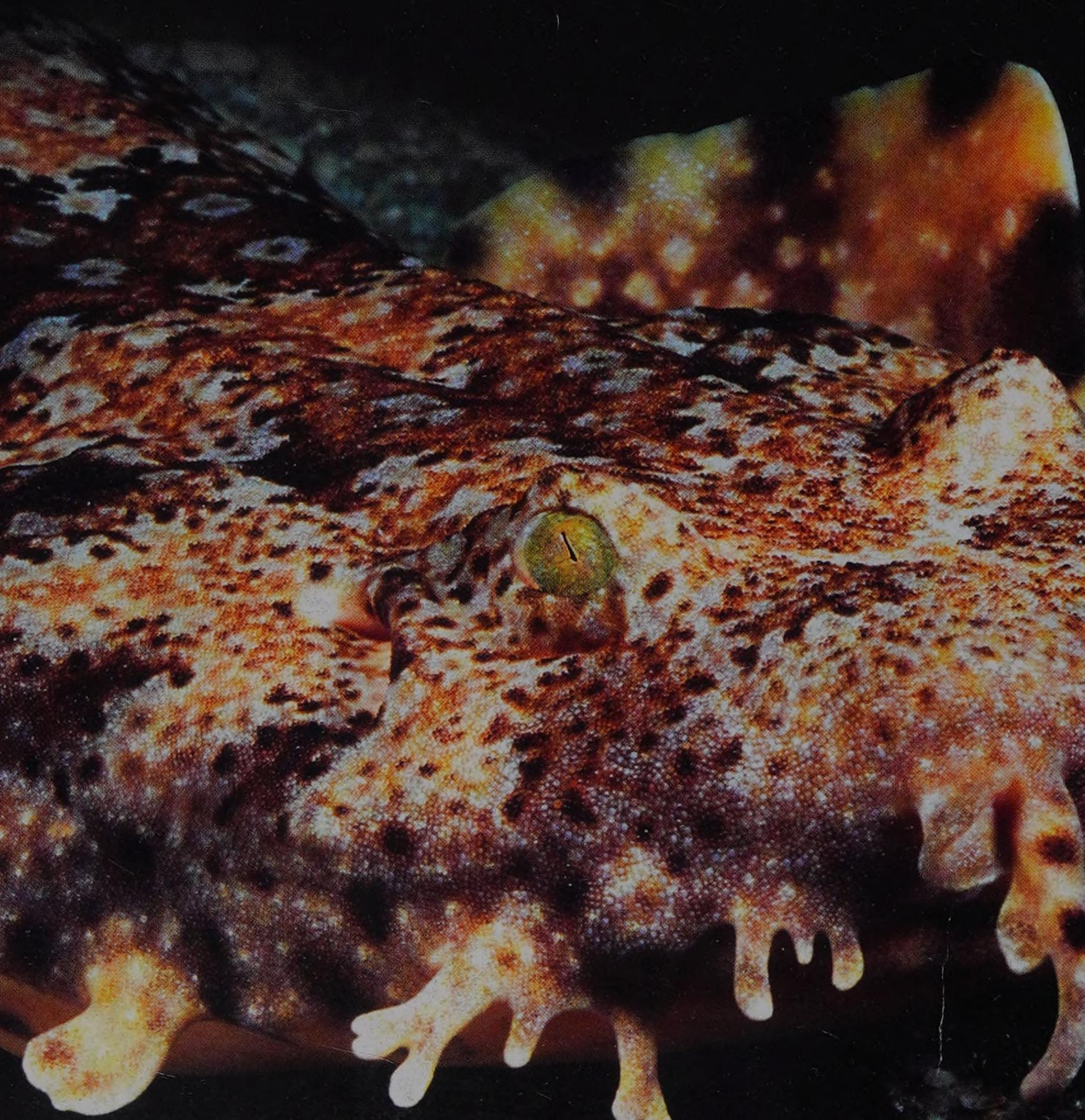
In this book you will have seen big sharks, powerful sharks, and sharks with fearsome teeth. But down in the deepest waters of the ocean are perhaps the strangest sharks of all.

Gruesome goblin

Goblin sharks wouldn't win any beauty contests! This rare shark is the only species to have a snout that sticks out from its forehead.

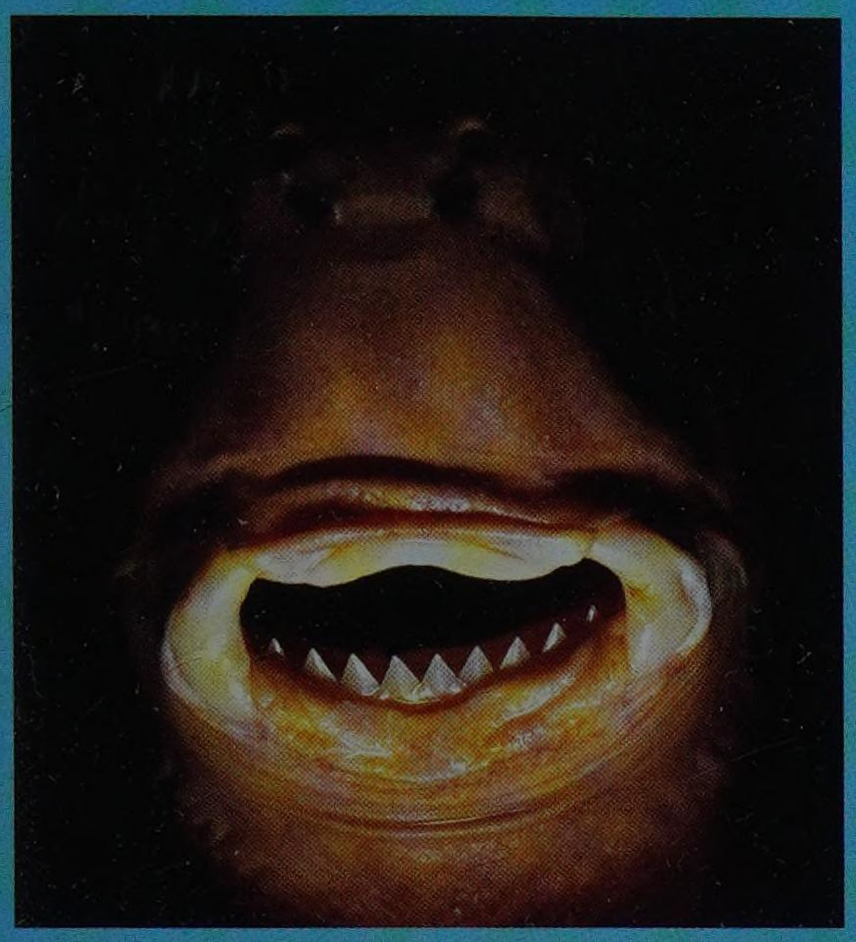
It's frilling!

Frilled sharks live up to 1,500 m (4,925 ft) below the surface of the sea. With its long, thin body and gills that look like frills, it looks rather like a scary eel.



Odd ones out

Wobbegongs live on the seabed in shallow water. Some species have tassles of skin that look like seaweed. Together with a flat body and sticking-up eyes, they look like no other shark in the sea.



Well travelled

Cookiecutter sharks leave bite marks of perfect circles on their prey. Some travel from the ocean depths to the surface at night to feed. That's a return trip of up to 7 km (4.4 miles) every day.

Weird facts

- Frilled sharks have 300 many-pronged teeth.
- Goblin sharks push their jaws forwards to eat, then pull them back in again.
- Cookiecutter sharks can make their bellies glow in the dark to attract prey.

The first megamouth was discovered about 40 years ago.

Big at the top

Not all strange sharks live deep in the water. Megamouths probably live only 150 m (500 ft) down. They are so rare, only a few of these big – and big-mouthed – sharks have ever been seen.

Velvetbelly lanternsharks may glow to find each other or to attract mates.

Lanternsharks have no need to glow when in light, shallow water.

Strike a light

It's dark in the ocean depths, but the world's smallest sharks can still be seen. Lanternsharks have special cells in their body that glow in the dark.

True or false?

It's time to test what you've learnt. Do you know which of these statements are true?

The saw shark uses its "saw" to cut up its food.
See page 21

Lemon sharks can give birth to up to 17 pups in one litter.
See page 25

The pointed snout of the blue shark helps it to smell better.
See page 8

Divers use SCUBA gear to navigate underwater.
See page 40

Nurse sharks use their cheek muscles to suck in water.
See page 13

Spinner sharks can grow up to 10 m (32 ft).

See page 5

Remoras hold on to sharks with their tentacles.

See page 34

Tiger sharks can grow 24,000 teeth in 10 years.

See page 17

Lanternsharks glow in the dark.

See page 45

Sting rays have up to 17 spines on their tail.

See page 32

A whale shark spits out food it doesn't like.

See page 29

Which way?

Help the shark move to a better feeding ground by answering the questions correctly.

START

Alaska

an oar

a hammer

A hammerhead's wide, flat head acts like...
See page 31

hibernate

eat pups

Great white sharks go to elephant seal colonies to...
See page 22

find cooler waters

move left or right

To avoid collisions, sharks...
See page 13

can stop suddenly

Basking sharks migrate between Scotland and...

See page 22

Australia

Canada

a wing

birthing pool

breeding land

The area where sharks go to give birth is called a...

See page 23

pupping ground

29 kph (18 mph)

25 kph (15 mph)

15 kph (10 mph)

When hunting, the great white shark can shoot forwards at...

See page 27

swim backwards

FINISH

Great escape!

Help the endangered shark escape the fishing nets and reach safer waters.

A boat comes towards you. **Go back 3**

A turtle shows the way. **Move forward 2**

A school of fish gets in your way. **Miss a turn**

Gill net drifts into your path. **Go back 4**

Find a safe passage through coral. **Move forward 2**

FINISH
You're safe now!

START

Feast on squid.
Move forward 3

Change route to avoid bigger sharks.
Go back 4

Wait for anglers to leave.
Miss a turn

Helped along by an ocean current!
Move forward 4

How to play

This game is for up to four players.

Move down

Move up

You will need

- A dice
- Counters – one for each player

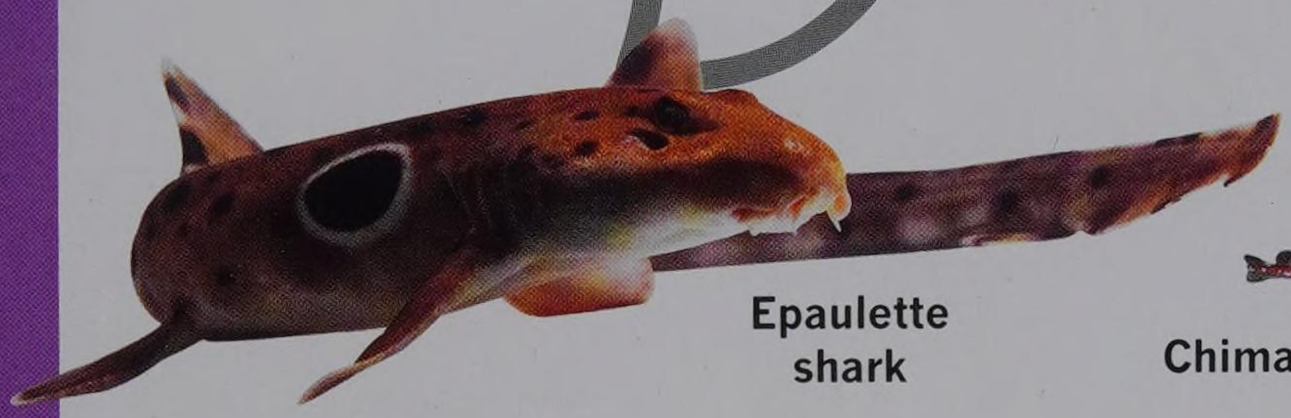
Trace over the shark outlines, or cut and colour your own from card. Each player takes turns to throw the dice, and begins from the START box. Follow the squares with each roll of the dice. If you land on an instruction, make sure you do as it says. Good luck!

Facts match

How well do you know sharks? Read the clues and find the correct answers among the pictures.

Angel shark

Sand tiger shark's teeth



Epaulette shark

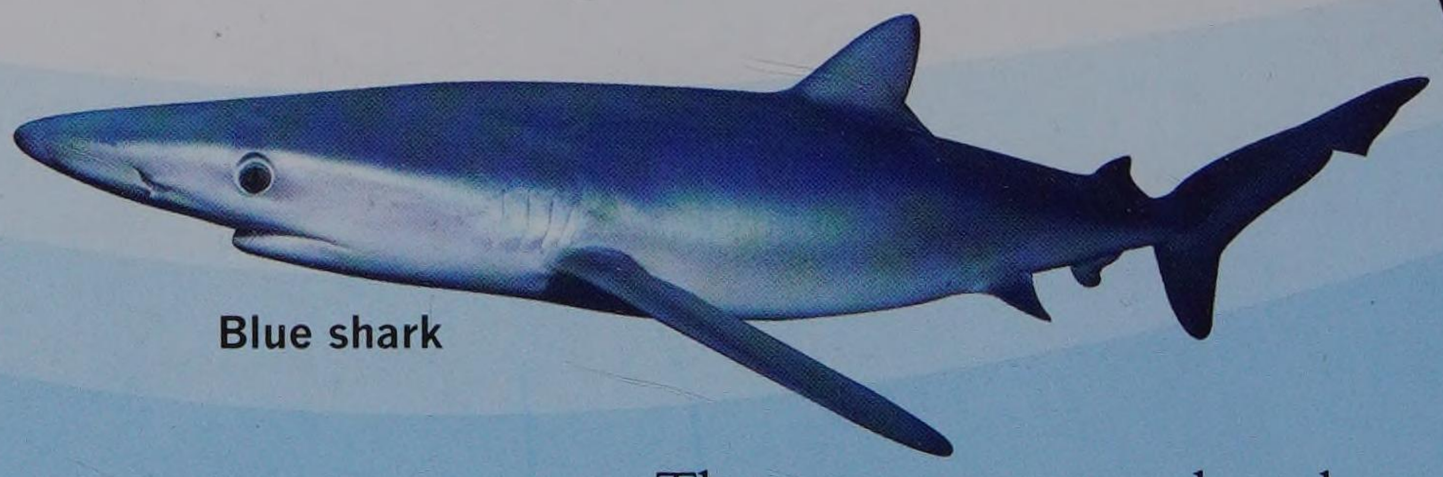
Chimaera

Manta ray

Plankton

Goblin shark

Spotted dogfish egg case



Blue shark

I use my tail to stun prey. **See page 11**

My pectoral fins help me to swim as well as walk along the seabed. **See page 13**

I feed on sharks' parasites and dung. **See page 35**

These are so strong that they can bite through a turtle's shell. **See page 16**

I have eyes on top of my head so I can see while I am resting on the seabed. **See page 20**

I have a small, spindly tail and my fins are also known as wings. **See page 32**

This looks like a leathery bag and is often called "mermaid's purse". **See page 24**

This is made up of tiny sea creatures and algae. **See page 29**

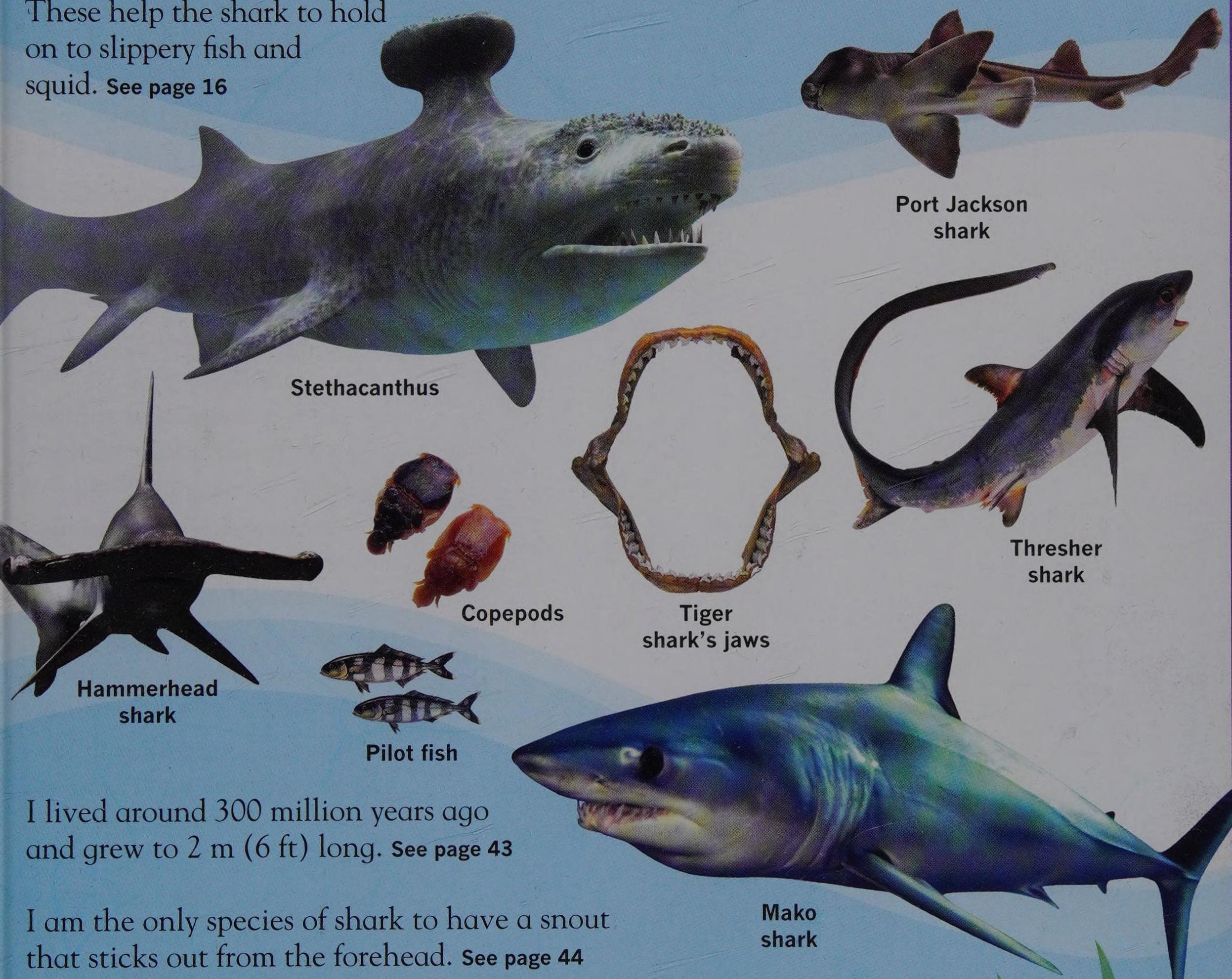
I have eyes at the ends of my wide head. **See page 30**

We hang around with sharks, often sticking onto their fins. **See page 35**

My dorsal fin is so sharp that I can injure people with it. **See page 33**

I have great power and speed, and can leap up to 6 m (20 ft) out of the water. **See page 11**

These help the shark to hold on to slippery fish and squid. **See page 16**



Stethacanthus

Port Jackson shark

Thresher shark

Hammerhead shark

Copepods

Tiger shark's jaws

Pilot fish

Mako shark

I lived around 300 million years ago and grew to 2 m (6 ft) long. **See page 43**

I am the only species of shark to have a snout that sticks out from the forehead. **See page 44**

I am also known as "pig fish" and I use my nostrils to sniff out prey. **See page 8**

I am the second fastest shark in the sea and can swim up to 69 kph (43 mph). **See page 13**

Glossary

Here are the meanings of some words that are useful to know when learning about sharks.

Ampullae of Lorenzini tiny sensors on a shark's snout that pick up electrical signals in the water. Sharks use them to find prey, and possibly to sense Earth's magnetic field to help them find their way in the sea.

Bait ball a school of fish that is targeted as prey by a shark or other predator.

Barbel a feeler that some sharks have on their snout, used for probing the seabed to find food.

Buoyancy the ability to float. Sharks have oil-filled livers to help their buoyancy.

Bycatch sharks and other sea creatures that accidentally get caught in fishing nets, which have been laid for other fish.

Camouflage a colour or pattern that blends in with its surroundings, so it can't be seen.

Carnivore an animal that eats only meat.

Cartilage gristle-like tissue inside animal bodies that is lighter and more flexible than bone.

Cartilaginous fish that have skeletons made of cartilage.

Caudal fin the shark's tail.

Chum a smelly liquid used to attract sharks. It is made from mashed fish.

Copepod a type of crustacean. There are thousands of different copepod species, some of which live on sharks' bodies.

Crustacean a type of animal with jointed legs, but without a backbone. They usually have hard outer shells. Copepods, krill, and crabs are crustaceans.

Denticles scales that cover a shark's skin. They are tooth-like and not like those on bony fish.

Dorsal fin a large fin in the middle of a shark's back, which helps stop the shark from rolling over. Some sharks also have a second, smaller dorsal fin near their tail.

Embryo an unborn animal that is developing inside its mother's womb or in an egg.

Endangered species a species that is in danger of becoming extinct. Critically endangered species (such as Ganges sharks) are in immediate danger of dying out if things do not change.

Extinct a species that has died out. *Megalodon* sharks are extinct.

Filter feeder sharks that take in huge amounts of sea water as they swim along, and filter out food contained in the water.

Finning chopping the fins off sharks to sell them. Often the shark is thrown back into the sea, where it dies.

Fossil the remains of an ancient animal or plant that have been preserved in rock.

Gills the part of a shark's body that absorbs oxygen from the water that the shark breathes in.

Gill rakers long bristles that filter feeders use to sieve food from the water they take in.

Gill slits openings in the shark's skin where water flows out. Most sharks have five gill slits.

Lateral line a line of cells along the sides of a shark that are sensitive to pressure and can detect movement in the water.

Migration moving from one place to another when seasons change. Some migrations involve very long journeys.

Oxygen a gas that is found in air and water. Most living things need oxygen to survive.

Parasite an animal that lives on or in another animal and takes food from its host.

Pectoral fin one of a pair of fins under the front of a shark's body, used to steer and give lift.

Pelvic fin one of a pair of fins under the rear of a shark's body, used to help stop the shark from rolling over.

Plankton tiny animals, plants, and algae that drift in the ocean. They are eaten by many larger animals.

Predator an animal that hunts, kills, and eats another animal.

Prey an animal that is hunted, killed, and eaten by a predator.

Pup a baby shark.

Pupping ground an area where sharks gather to give birth.

Scavenger an animal that searches for food scraps, rather than hunting prey. Scavengers often eat the remains of animals killed by others.

School (of fish) a large number of fish that swim together.

SCUBA diving diving with air-tanks. "SCUBA" stands for Self-Contained Underwater Breathing Apparatus.

Snout the front part of a shark's head.

Species a group of animals or plants of the same type that can produce young together.

Spiracles an extra pair of gill openings that supply oxygen to the shark's eyes and brain.

Streamlined a smooth shape that allows some sharks to swim faster.

Swim bladder an air sac inside bony fish that they can fill with air to help them float. Sharks do not have a swim bladder.

Tapetum a layer of cells at the back of a shark's eye that reflects light, helping it to see in the dark.

Umbilical cord a tube that connects an embryo to a placenta. The placenta absorbs oxygen and nutrients from the mother's blood to supply the embryo.

Index

Ampullae of Lorenzini 15
Angel shark 20

Bait ball 19
Barbel 9, 21
Barberfish 31
Basking shark 4–5, 7, 17, 22, 28
Black tip shark 10
Blue shark 8, 13, 19
Bony fish 6–7
Brownbanded bamboo shark 5, 15
Bull shark 8, 22
Bycatch 38, 39

Camouflage 11, 21
Cartilage 6–7
Catsharks 43
Chimaera 33
Cladoselache 42
Cookiecutter shark 18, 45
Copepod 35

Denticles 6, 43
Dogfish 24, 25, 38

Eagle ray 33
Eggs 24, 25
Electrical sense 14, 21
Epaulette shark 13, 21
Eyes 8, 9, 14, 20, 30

Filter feeders 17, 28–29
Finning 36, 38, 39
Fins 6–7, 12, 13, 20, 32, 34
Fossils 42, 43
Frilled shark 44, 45

Ganges shark 39
Gill rakers 28
Gill slits 7
Gills 7, 13, 28
Giving birth 23, 24, 25, 39
Goblin shark 44, 45
Great white shark 5, 10, 16, 23, 26–27, 40–41, 42
Greenland shark 35, 37
Gulper shark 39

Hammerhead sharks 5, 9, 25, 30–31, 33, 38
Horn shark 24

Jaws 16–17, 37, 42

Keel 6
Krill 19

Lanternsharks 4, 5, 45
Lateral line 15
Lemon shark 23, 25
Liver oil 7, 36

Mako shark 8, 13, 37, 40
Manta ray 32
Megalodon 42
Megamouth shark 45
Mermaid's purses 24
Migration 22–23, 31

Nostrils 7, 8, 15, 30
Nurse shark 5, 9, 13, 22

Parasites 34, 35
Pilot fish 35
Plankton 17, 28, 29
Port Jackson shark 8, 17
Pups 24–25

Remora 34

Salmon shark 22
Sand tiger shark 16, 39
Saw shark 9, 21
Seals 19, 22, 27
Seal lure 41
Shark fin soup 37, 38
Shark meat 36, 37, 38, 39
Shellfish 8, 17, 19
Skeleton 6–7
Spinner shark 5
Spiracles 7
Stethacanthus 43
Stingray 19, 31, 32–33
Swell shark 11, 19, 21
Swim bladder 7
Swimming 8, 10, 12–13

Tagging 23, 40
Tail 6, 10–11, 12
Tapetum 14
Tapeworm 35
Tastebuds 15
Teeth 8, 9, 16–17, 37
Thresher shark 11, 39
Tiger shark 5, 16–17, 19
Turtle 16, 19, 31

Whale shark 4–5, 29, 34
Wobbegong 21, 44

Acknowledgements

Dorling Kindersley would like to thank:
Andy Cooke for original artwork, Sadie Thomas, Mary Sandberg, and Katie Newman for design assistance, Simon Mumford for cartography, and Rob Nunn, Claire Bowers, and Emma Shepherd in the DK Picture Library.

Picture credits

The publisher would like to thank the following for their kind permission to reproduce their photographs:
a=above; c=centre; b=below; l=left; r=right; t=top

Alamy Images: Mark Conlin 19t, 39br; Chris A Crumley 9tl; Ethan Daniels 21cr; David Fleetham 10tr, 26t, 44b; Geoffrey Kidd 16cr; Jeff Rotman 4-5, 25cl; Visual & Written SL 41t, Travelib Africa 50-51b, Martin Strmiska 50br; **Ardea:** Ken Lucas 13br; **Corbis:** Amos Nachoum 8t, 13c, 13t; Ralph A. Clevenger 19br; Clouds Hill Imaging Ltd 6t; Brandon D Cole 33br; Tim Davis 26b; Douglas P. Wilson/Frank Lane Picture Agency 24c, 24cb, 24cr; Stephen Frink 8cl, 34bl; image100 25; Momatiuk-Eastcott 22b; Louie Psihoyos 42br; Jeffrey L Rotman 2cla, 8cr, 9cr; Jeffrey L. Rotman 17cr, 37br, 40-41; Denis Scott 2-3; Paul Souders 19cl, 19crb; **Dorling Kindersley:** Colin Keates/Courtesy of the Natural History Museum, London 16-17, 56tc; Harry Taylor /Courtesy of the Natural History Museum, London 16bc, 17bc, 17tc, 17tr, 42bl, 43c; Mike Row (c) The British Museum 37bl; Richard Davies of Oxford Scientific Films 12bc, 12bl, 12br, Natural History Museum, London 52cra, 53c, 53cb, Rough Guides 50tr; **Dreamstime.com:** 111camellia 59cb (Shark), 3quarks 52clb, Rostislav Ageev 49fclb, Greg Amptman 52c, 58bc, 59br, Fiona Ayerst 46cl, 58cla, Beaucroft 58cra, Carol Buchanan 48bl, 49fcrb, 58c, Mingwei Chan 58c (Squid), Karl Daniels 59c, Inga Ivanova 51tc (Blinking squid), Shawn Jackson 58tc, Kjersti Joergensen 46bl, Jonmilnes 59tr, Kupparock 59cla, Marco Lijoi 46-47tc, 58br, Luizrocha 58crb, Mikhail Matsonashvili 59cb (Baby shark), Dirk-jan Mattaar 50bl, 51bl, Ben Mcleish 59ca, Mr1805 58fclb, Nicolegardner 50cb, 51cla, 51c, 51crb, 51bc, Krzysztof Odziomek 47b, Maxim Petrichuk 51cr, Ian Scott 53clb, Tobie1953 59fcr, Vilmos Varga 59tl, Paul Vinten 59fcra, Willyambradberry 59cb, Wksp 49cr, Yobro10 47crb; **Fotolia:** uwimages 49clb, 49crb, 49bc; **The Field Museum:** Karen Carr 43cr; **FLPA:** Mike Parry 1; Norbert Wu 35c, 36b, 36tr; **Getty Images:** altrendo images 8-9t; Brandon Cole/Visuals Unlimited 38b; Bill Curtsinger/National Geographic 45t; Stephen Frink 10tl, 16bl; Larry Gatz 12-13; George Grall 16tl; Ken Lucas 15ca; David Nardini 23c; Benne Ochs 15bl; Rich Reid 19cra; Jeff Rotman 15br; Brian Skerry/ National Geographic 18-19; Paul Souders 19c; Darryl Torckler 56; Mark Webster 22tr; David Wrobel 8-9b, : Dea Picture Library 53cb (pilot fish), Frank Krahmer / Photographer's Choice RF 58clb, James R.D. Scott / Flickr 53br, Axel Rosenberg / Flickr 49cla, Michele Westmorland / Photodisc 51tc; **Hunterian Museum:** Hunterian Museum & Art Gallery, University of Glasgow 43cb; **imagequestmarine.com:** Kelvin Aiken/V&W 9tr, 20br; Mark Conlin-VWPics.com 40bc, 40bl, 40br; Klaus Jost 19cr; Andy Murch/V&W 21t; Andre Seale 33tc; Jez Tryner 29br; Masa Ushioda 32b; Dray van Beeck 35t; James D. Watt 33tr, 34t; **iStockphoto.com:** Robert Dant 16ca; **naturepl.com:** Brandon Cole 11c; Doug Perrine 8bl, 9br; Georgette Douwma 24br; Florian Graner 45bl; Alan James 28t; Nature Production 24bl; Jeff Rotman 27bl, 30tl; **NHPA/Photoshot:** Michael Patrick O'Neill 34br; Tom & Therisa Stack 32-33; **Photolibrary:** Dave Fleetham 6-7c; OSF/Howard Hall 17br; Paulo De Oliveira/OSF 44tr; **SeaPics.com:** 31c; George W. Benz 37tr; Marc Bernardi 31bl; Bob Cranston 31t; Doc White 6b, 54-55; Doug Perrine 11tl, 14cr, 17cla, 23b, 23tr, 25b, 25tr, 29t, 39t; Steve Drogin 29c; David Fleetham 30tr; Saul Gonor 38t; Florian Graner 43t; Tom Haight 45c; Makoto Hirose/e-Photography 20tr; Makoto Kubo/e-Photography 21br; D. W. Miller 42tl; Michael S. Nolan 18cl; Doug Olander 39cl; Peter Parks/iq-3d 29bl; Espen Redkal 45cb; Jeff Rotman 7t, 30b; David Shen 44cl; Jeremy Stafford-Deitsch 18t, 21cl; Mark Strickland 22t; Masa Ushioda 37tl; James D. Watt 14-15, 31b; David Wrobel 11tr; **Still Pictures:** Klaus Jost 27t

All other images © Dorling Kindersley
For further information see: www.dkimages.com

Epaulette shark

Caribbean reef shark

Nurse shark's barbels

Lemon shark

Shark's jaws

Reef shark

Dogfish

Crab

Smoothhound shark

Sea lion

Manta ray

Squid

Black tip reef shark

Feeding frenzy

Penguins

Shark's skeleton

Elephant seal

Great white shark

Leopard shark

Horn shark

story M...eu...
y Museum, London 16bc, 17bc, 17...
m 37bl; Richard Davies of Oxford S...
y Museum, London 52cra, 53c, 53cl...
mellia 59cb (Shark), 3quarks 52clb,...
3bc, 59br, Fiona Ayerst 46cl, 58cla, ...
58c, Mingwei Chan 58c (Squid), Kc...
d), Shawn Jackson 58tc, Kjersti Joe...
Marco Lijoi 46-47tc, 58br, Luizro...

Port Jackson shark

Ratfish

Dolphin

Remora

Catfish on seabed

Shark's eye

Orca whale

Grey reef shark

Bait ball

Ragged tooth shark

Fossilized shark's tooth

Horn shark's egg case

Coral shark

Horn shark

Sardines

Eagel ray

Krill

Sea horse

Bull shark

Octopus

Gannet

Turtle

Hammerhead shark

White tip shark

Shark pup

Seagull

Nurse shark

Prehistoric shark

Starry smoothhound shark

Spotted ray

eyewonder

Sharks

Dive into the ocean and meet the amazing creatures that live in its depths.

See tiny **lanternsharks**, hungry **hammerheads**, and speedy **makos**!

Discover the stingray's **deadly weapon**, go diving with the **famous great white**, and come face-to-face with the **largest fish in the world**.

Test your knowledge and have hours of fun with 8 pages of **fabulous activities** and **50 great stickers**!

DK: working for a sustainable future

- Our paper is assessed for its environmental impact.
- We check our suppliers' working conditions and eco credentials.
- Our business is climate neutral.
- We support literacy initiatives around the world.

www.dk.com/sustainable-future

DK

Discover more at
www.dk.com

ISBN 978-1-40

9 781409 3